EVALUATION OF THE EFFECT OF ADDITION OF CLONIDINE TO 0.5% ROPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Dissertation submitted to

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With fulfillment of the regulations

for the award of Degree

M.D. ANAESTHESIOLOGY

BRANCH – X

DEPARTMENT OF ANAESTHESIOLOGY,

K.A.P.V. GOVERNMENT MEDICAL COLLEGE,

TRICHY.

APRIL 2016

CERTIFICATE

This is certify that this dissertation titled **"EVALUATION OF THE EFFECT OF ADDITION OF CLONIDINE TO 0.5% ROPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK"** is a bonafide work of **DR.D.ELAVARASAN.,** Post Graduate in M.D. Anaesthesiology, Department of Anaesthesiology, K.A.P.V. Government Medical College, Trichy and has been prepared by him under our guidance. This has been submitted in partial fulfillment of regulations of The Tamil Nadu Dr. M.G.R Medical University, Chennai-32 for the award of M.D. Degree in Anaesthesiology.

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DECLARATION

I **Dr. D. ELAVARASAN.,** solemnly declare that this dissertation title, "**EVALUATION OF THE FFECT OF ADDITION OF CLONIDINE TO 0.5% ROPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK**" is a bonafide work done by me at K.A.P.V. Government Medical College during 2014-2016 under the guidance and supervision of **Prof. Dr. N. Jothi, MD., DA.,** Professor and Head of Department, Department of Anaesthesiology.

The dissertation is submitted to the Tamilnadu Dr. M. G. R. Medical University, towards the partial fulfillment of requirement for the award of M.D. Degree in Anaesthesiology Branch X.

Place:

Date : ***Dr. D. ELAVARASAN***

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CERTIFICATE OF CLEARANCE

This is to certify that the project work titled **Effect of addition of Clonidine to 0.5% Ropivacaine in Supraclavicular Brachial plexus block** proposed by **Dr.D.Elavarasan, D.A.,** part of fulfillment of M.D/M.S course in the subject of **Anaesthesia** for the year **2014-2016** by The Tamilnadu Dr.MGR Medical University has been cleared by the Ethics committee.

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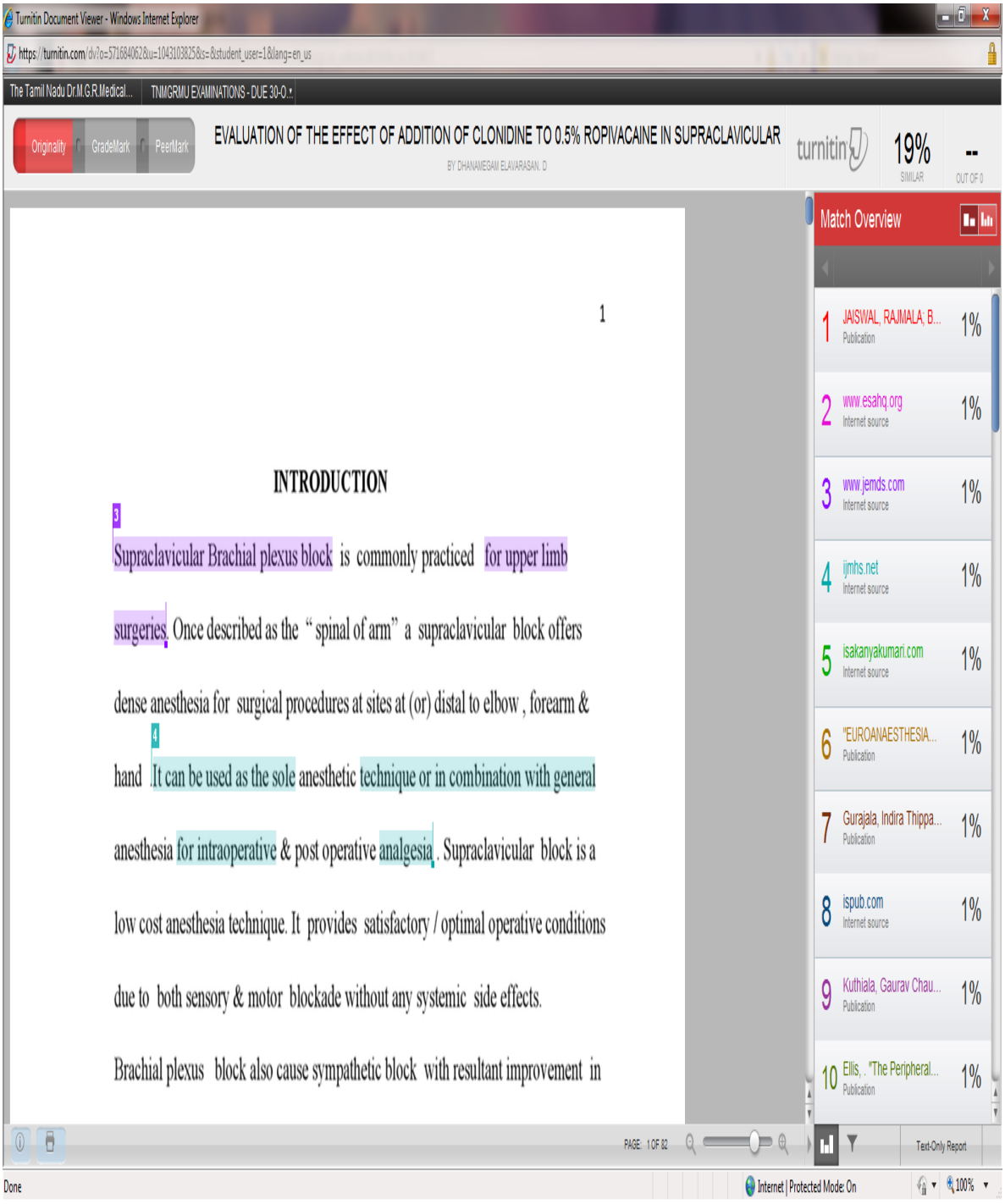
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INTRODUCTION
Supraclavicular Brachial plexus block is commonly practiced for upper limb surgeries. Once described as the " spinal of arm" a supraclavicular block offers dense anesthesia for surgical procedures at sites at (or) distal to elbow , forearm & hand .It can be used as the sole anesthetic technique or in combination with general anesthesia for intraoperative & post operative analgesia . Supraclavicular block is a low cost anesthesia technique. It provides satisfactory / optimal operative conditions due to both sensory & motor blockade without any systemic side effects.
Brachial plexus block also cause sympathetic block with resultant improvement in
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INTRODUCTION

Supraclavicular Brachial plexus block is commonly practiced for upper limb surgeries. Once described as the " spinal of arm" a supraclavicular block offers dense anesthesia for surgical procedures at sites at or distal to elbow , forearm & hand . It can be used as the sole anesthetic technique or in combination with general anesthesia for intraoperative & post operative analgesia . Supraclavicular block is a low cost anesthesia technique. It provides satisfactory / optimal operative conditions due to both sensory & motor blockade without any systemic side effects.

Brachial plexus block also cause sympathetic block with resultant improvement in blood flow, reduction in vasospasm,& edema which is more favourable for acute hand injury and reconstructive plastic surgery.

Common sites of approach to Brachial plexus block are , (a) Interscalene, (b) supraclavicular,(c) infraclavicular (d) Axillary and (e) posterior approach.

It is a must for all practicing anesthesiologist to be familiar with all the above approaches as well as each one's advantages & limitations.

Supraclavicular approach is one of the ancient and most convenient method for performing brachial plexus block.

Bupivacaine ,(amide local anesthetic) is the most commonly used drug for peripheral nerve block .but recently Ropivacaine has been successfully used.

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ABBREVATIONS

µg	-	MicroGram
ASA	-	American society of Anaesthesiologist
CMax	-	Maximum Concentration
CNB	-	Central neuroaxial block
CNS	-	Central nervous system
CO	-	Cardiac out put
CVS	-	Cardio vascular system
DBP	-	Diastolic Blood pressure
ECG	-	Electrocardiogram
GIT	-	Gastro intestinal system
HR	-	Heart rate
I.M	-	Intramuscular
I.V	-	Intravascular
Inj	-	Injection
kg/Bw	-	Kilogram/ Body weight
LA	-	Local anesthetics
LFT	-	Liver function test
MAC	-	Minimum alveolar concentration .
MHz	-	Mega hertz
Min	-	Minutes.
ml	-	Milli Litre

mmHg	-	Milli meter of mercury
NIBP	-	Non invasive blood pressure
PNB	-	Peripheral neuroaxial block
PR	-	Pulse rate
R	-	Ropivacaine
RC	-	Ropivacaine and Clonidine
SBP	-	Systolic Blood pressure
SD	-	Standard deviation .
Spo2	-	Saturation of partial pressure of oxygen
SVR	-	Systemic vascular resistance
VAS	-	Visual Analogue Scale
VD	-	Volume of distribution

INTRODUCTION

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Supraclavicular Brachial plexus block is commonly practiced for upper limb surgeries. Once described as the " spinal of arm" a supraclavicular block offers dense anesthesia for surgical procedures at sites at (or) distal to elbow, forearm & hand. It can be used as the sole anesthetic technique or in combination with general anesthesia for intraoperative &post operative analgesia. Supraclavicular block is a low cost anesthesia technique. It provides satisfactory/ optimal operative conditions due to both sensory &motor blockade without any systemic side effects.

Brachial plexus block also cause sympathetic block with resultant improvement in blood flow, reduction in vasospasm & edema which is more favorable for acute hand injury and reconstructive plastic surgery.

Common sites of approach to Brachial plexus block are Interscalene, supraclavicular, Infraclavicular, Axillary and posterior approach.

It is a must for all practicing anesthesiologist to be familiar with all the above approaches as well as each one's advantages & limitations. Supraclavicular approach is one of the easiest and most consistent method for performing brachial plexus block.

Bupivacaine, (amide local anesthetic) is the most commonly used drug for peripheral nerve block, but recently Ropivacaine has been successfully used.

Ropivacaine[1] is an amino amide local anesthetic prepared as pure S–enantiomer. Ropivacaine has lesser lipid solubility and also produce less central nervous toxicity and cardio toxicity with less arrhythmogenic potential.

The purpose of adding an adjuvant to local anesthetics for peripheral nerve block is to have early onset of sensory and motor block and to prolong the duration of post operative analgesia with lesser adverse effect[2].

Several clinical investigations have shown that Clonidine prolongs the post operative analgesia. Clonidine is an α 2-agonist. Although it had been used originally as an anti hypertensive agent, it has sedative, sympatholytic and analgesic property[3].

Successful brachial plexus block depends on proper nerve localization, needle placement, local anesthetic injection i.e. right drug, right dose, placed in the right place, by the right technique.

Traditional land mark approach and elicitation of paraesthesia necessitates multiple attempts, resulting in procedure related complications such as pain, injury to blood vessels and pneumothorax.

Ultrasound guided supraclavicular brachial plexus block has become popular currently, owing to detection of anatomical variation of brachial plexus, accuracy of needle placements and avoidance of needle related complications such as injury to blood vessels, pneumothorax & local anesthetic toxicity[4,5].

The present study is a randomized double blind placebo control study to evaluate the effects of Clonidine administration with Ropivacaine in supraclavicular brachial plexus block.

AIMS AND OBJECTIVES

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To evaluate the effect of addition of Clonidine to 0.5% Ropivacaine in Supraclavicular Brachial Plexus block for patient's undergoing upper limb surgeries in terms of onset and duration of sensory and motor block & duration of postoperative analgesia.

REVIEW OF LITERATURE

REVIEW OF THE LITERATURE

1.Quazi et al[6] added 75µg of clonidine to Ropivacaine for supraclavicular brachial plexus for upper limb orthopedic surgeries. The study design was randomized, double blind placebo controlled study. The study group was divided into two categories:

- Group A patients: received 30ml of 0.5% Ropivacaine& 0.5 ml of normal saline.
- Group B patients: received 30ml of 0.5% Ropivacaine& 0.5 ml of (75µg) clonidine.

Aim of this study was to evaluate the effect of addition of clonidine to Ropivacaine in brachial plexus block (in supraclavicular approach). They also observed onset, duration, quality of sensory & motor block and also the duration of post operative analgesia and the complications.

They concluded that addition of clonidine to Ropivacaine for supraclavicular brachial plexus block provides good analgesia, motor blockade. Clonidine when added to Ropivacaine significantly extend the sensory & motor block duration and the duration of post operative analgesia & reduces the requirement of rescue analgesia without any major hemodynamic alteration.

2.Sidharth SR et al.[7] did the study on orthopedic patients who underwent upper limb surgeries. The study population was divided into two groups. Each group consisting of 40 patients.

Here,

- Group A receives 35 ml of 0.5% Ropivacaine with 150 µg of clonidine .
- Group B receives 35 ml of 0.5 % Ropivacaine with 1 ml of normal saline.

In this study they wanted to compare the onset & duration of sensory & motor blockade, duration of post operative analgesia, sedation & observed for any side effect of drugs, complication of anesthetic procedure.

In conclusion of their study, addition of clonidine to Ropivacaine improves the quality & duration of supraclavicular block.

Clonidine not only enhance speed of onset , but also prolongs the duration of sensory & motor blockade & prolong the duration of analgesia in post operatively without major hemodynamic changes. Additional advantage of clonidine was more sedative potential, reduction in anxiety& better patient comfort in intra operative & post operative period.

3. Bafna et al[8] reported that clonidine added as adjuvant to Ropivacaine in supraclavicular block for upper limb surgeries, gave significant prolongation of sensory & motor blockade.

The study population was divided into two groups. Each group consisted of 40 patients both ASA I & II.

- Group I → 40 patients received 28 ml of 0.5 % Ropivacaine & 2 ml of normal saline.
- Group II → 40 patients received 28 ml of 0.5 % Ropivacaine & 2 µgm/kgBWt of clonidine.

They assessed the onset of sensory & motor block, duration of sensory & motor block & observed the sedation score.

They concluded that clonidine was when added as adjuvant to 0.5% Ropivacaine in brachial plexus block; it increased the sensory & motor duration when compared to Ropivacaine alone, without side effects.

4.**Gupta et al**[9] did a prospective randomized double blind clinical study .The study population divided into two groups .Each group consisted of 32 patients ASA I & II.

- Group (R) received 19.8ml of 0.75% Ropivacaine & 0.2 ml Normal saline.
- Group (RC) received 19.8ml of 0.75% Ropivacaine& 30µgm of clonidine

Block performed with ultrasound guided technique.

They observe the onset of sensory & motor block, duration of sensory & motor blockade & duration of postoperative analgesia.

Their conclusion was that when clonidine was added as adjuvant to Ropivacaine with ultrasound guided nerve block, it resulted in

Faster onset of sensory block: R group (2.5min) & RC group (2.36min)

Faster onset of motor block: R(3.10 min) & RC (3.87 min)

& prolongation of duration of sensory& motor blockade & post operative analgesia without alteration of hemodynamic adverse effects.

5. Shobana Gupta et al[10] studied the effect of clonidine as an adjuvant of 0.75% Ropivacaine (30ml) in supraclavicular plexus block in patients undergoing upper limb orthopedic surgeries. The study was done with 60 patients ASA I & II divided into two groups (R) & (RC).They monitored the onset of sensory & motor block, duration of sensory & motor block & observed the sedation score.

Thus they concluded that the Ropivacaine is long acting Local anesthesia with moderate onset period & longer post operative analgesia. The addition of Clonidine (150 µg) resulted in delay in the onset time of sensory & motor block & prolongation of motor block duration of analgesia, does not cause major adverse effect & complication.

6.Ravi madhusudhanan et al [11] did a comparative pilot study in supraclavicular plexus block with 0.75% Ropivacaine & added to adjuvant Tramadol, Fentanyl .Their total study population was 30 patients ASA I & II divided into three groups

- Group I : Received 0.75% Ropivacaine 30ml
- Group II : Received 0.75% Ropivacaine 29ml + Inj. Tramadol (50mg) 1 ml
- Group III: Received 0.75% Ropivacaine 29ml + Inj. Fentanyl (50mg) 1 ml

They assess the onset, quality & duration of sensory & motor block with Ropivacaine & compare the additive (Tramadol & Fentanyl).Observation of their study was Onset time of sensory & motor blockade was not significantly different between control & test groups.

Average onset of sensory block 5 min , motor block 14 min , duration of sensory block (9hrs) , motor block (8hrs) was significant .additive group was compared with control group (sensory 6 hr, motor 5 hrs).Their conclusion was that addition of opioids to Ropivacaine had additive effect in prolongation of postoperative analgesia .

7. The study done by **Saritha.S.Swamiet al**[12] in, orthopedic upper limb surgical patients showed that addition of Clonidine &Dexmeditomidine in supraclavicular brachial plexus block result in prolongation of sensory & motor blockade in post operative analgesia. The study was done in 60 ASA I & II patients of either sex, aged 18-60 years & divided them into two groups.

- Group C→ Bupivacaine 0.25% (35cc)+Clonidine 1 µg /kg BW
- Group D→ Bupivacaine 0.25% (35cc)+Dexmeditomidine 1 µg/kgBW

They compared the onset time of sensory & motor blockade, duration of sensory & motor blockade, duration of analgesia in postoperative period between the groups. They observed that the onset of sensory block was faster in Group D than Group C.

Motor block was faster in Clonidine than Dexmeditomidine. Duration of sensory block increased in Group D (413 min) than Group C (227 min). Duration of motor block 292 min (C Group) compared with 472 min in D Group. Post operative analgesia duration in D Group was 456 min when compared with C Group (289 min).They concluded that Dexmeditomidine prolongs the duration of sensory & motor block and enhances the quality of block compared with Clonidine when added as adjuvant to Bupivacaine in peripheral nerve block.

8.**Birbalbaj et al**[13] did a comparative study of effect of Clonidine added to Ropivacaine & plain Ropivacaine during supraclavicular block for patients undergoing upper limb surgeries. Their study population (60 patients) allocated into two groups, each comprising 30 patients.

- Group I→receive 30 ml of coded drugs.
- Group II→ receive 30 ml of 0.75% Ropivacaine& Clonidine 60 µg /Kg.

They used paraesthesia eliciting technique for anesthetizing the supraclavicular brachial plexus.

They observe mean time of onset of sensory & motor block, mean duration of sensory & motor blockade and duration of post operative analgesia.

They conclude that when was Clonidine when added to Ropivacaine for brachial plexus block, almost same onset time of sensory & motor block was obtained as compared to plain Ropivacaine ,but the duration of both sensory & motor block was increased. Postoperative analgesia duration was significantly prolonged in Clonidine group .Clonidine produced sedation in some patients that was statistically insignificant. Clonidine & Ropivacaine does not cause any adverse effect in supraclavicular brachial plexus block.

9.**Bansal et al1[4].**conducted a prospective randomized double blind study among 60 patients belonging to ASA I & II scheduled for forearm & hand surgery. They were divided into two groups, each comprising 30 patients.

- Group I → (n=30) received 35 ml of 0.5% Ropivacaine + 1 ml of Normal saline.
- Group II → (n=30) received 35 ml of 0.5% Ropivacaine + 1 ml of (150 µg) clonidine.

Brachial plexus block was performed by using nerve locator, single injection technique. They observed mean onset time of sensory & motor blockade and mean duration of sensory & motor blockade. They concluded that Clonidine (150 µgm) added as adjuvant to Ropivacaine (175 mg) had no benefit in the onset or duration block. Ropivacaine itself offered profound effect in brachial plexus block without producing side effects.

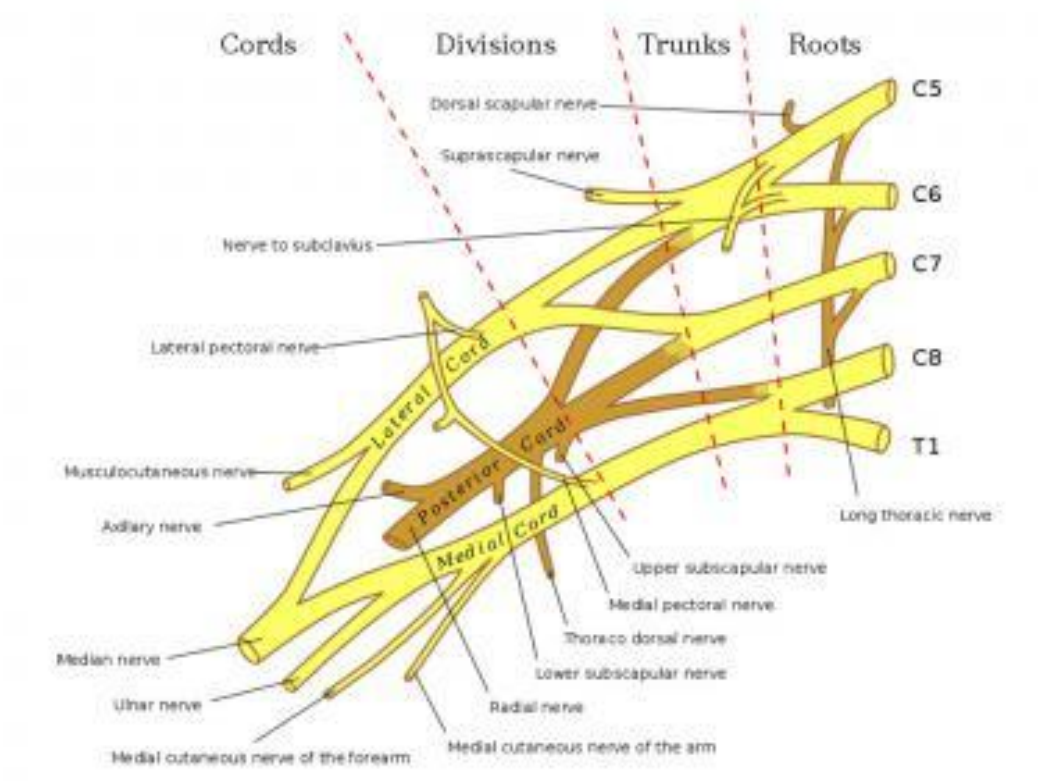
10.Santvana Kohli et al[15]. Performed a prospective randomized double blinded study for Clonidine as adjuvant in two different doses added to Bupivacaine (in supraclavicular block) for patients undergoing upper extremity surgery.

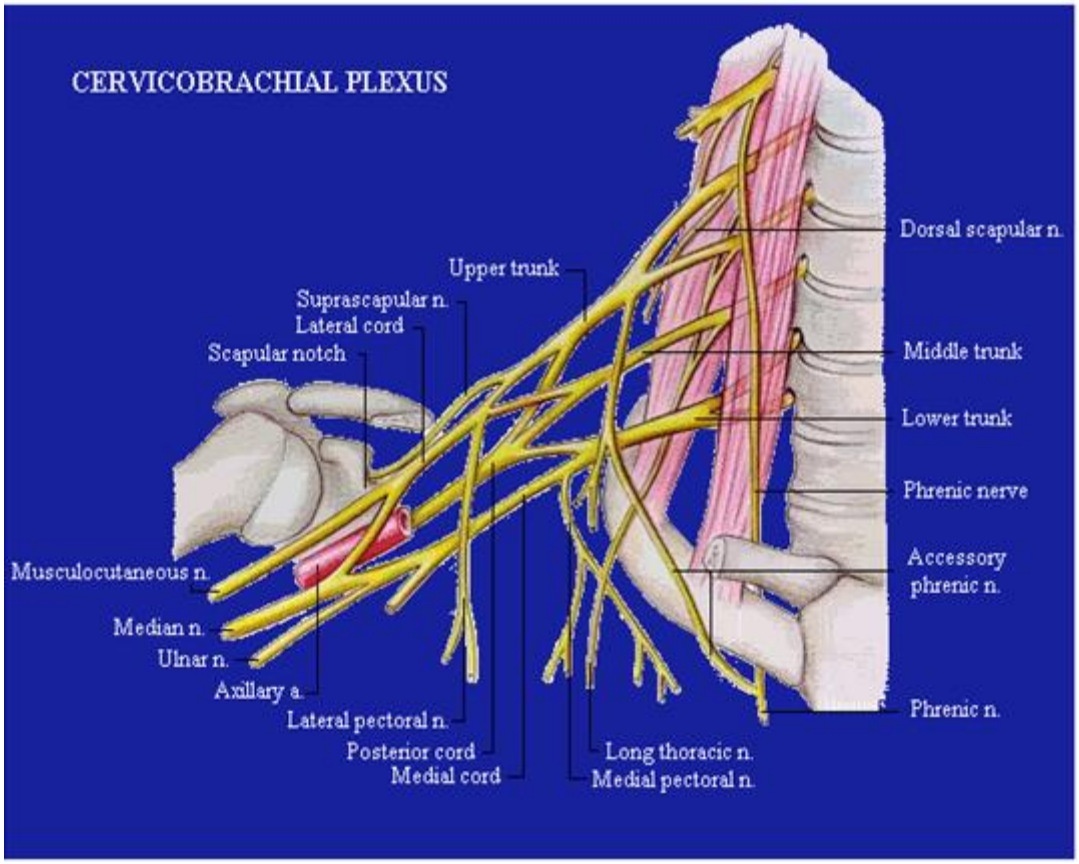
60 patients (18-65 years were included both ASA I & II .The study population divided into two groups.

- Group I → (n=30) received 30 ml of 0.5% Bupivacaine + 1 µgm/kg of Clonidine
- Group II → (n=30) received 30 ml of 0.5% Bupivacaine + 2 µgm /kg of Clonidine

They used nerve locator for doing supraclavicular brachial plexus block. They assess the sensory & motor onset time & duration of sensory & motor bock and duration of post operative analgesia. Their conclusion was that using higher dose of Clonidine as adjuvant to brachial plexus block, improves the time of onset of sensory & motor blockade, prolongs the sensory & motor blockade & provides post operative analgesia. Higher doses may cause more sedation that can allay patient anxiety &ensure better intraoperative & postoperative patient comfort.

ANATOMY


Cords
Divisions
Trunks
Roots
C5
C6
C7
C8
T1
Dorsal scapular nerve
Suprascapular nerve
Nerve to subclavius
Lateral pectoral nerve
Lateral Cord
Posterior Cord
Medial Cord
Musculocutaneous nerve
Axillary nerve
Median nerve
Ulnar nerve
Medial cutaneous nerve of the forearm
Radial nerve
Medial cutaneous nerve of the arm
Upper subscapular nerve
Medial pectoral nerve
Thoraco dorsal nerve
Lower subscapular nerve
Long thoracic nerve


CERVICOBRACHIAL PLEXUS
Dorsal scapular n.
Upper trunk
Suprascapular n.
Lateral cord
Scapular notch
Middle trunk
Lower trunk
Phrenic nerve
Accessory phrenic n.
Musculocutaneous n.
Median n.
Ulnar n.
Axillary a.
Lateral pectoral n.
Posterior cord
Medial cord
Long thoracic n.
Medial pectoral n.
Phrenic n.

ANATOMY

Thorough knowledge about anatomy of brachial plexus is essential for performing successful brachial plexus block[16].

Brachial plexus consists of

- Roots
- Trunks
- Divisions
- Cords.

ROOTS:

It derived from the anterior primary rami of the spinal nerves 5^{th}, 6^{th}, 7^{th}, 8th cervical nerve and 1st thoracic nerve and also from the C4 to T2.The formation of brachial plexus may be one segment upwards (or)one segment downwards resulting in prefixed or post fixed plexus respectively.

- **In Prefixed** plexus C4 is large and T2 contribution is absent.
- **In Post fixed** plexus the contribution by T1 is large, T2is always present ,C4 is absent and C5 is reduced in size.

TRUNKS:

Nerve roots are unite to form the trunks, which emerges between the anterior scalenus and medial scalenus muscles .C5and C6 unites form the upper trunk, C7 make up the middle trunk, C8 and T1 unites to form the lower trunk.

DIVISIONS:

Trunks are bifurcated into anterior division & posterior division, which are situated in between lateral border of first rib and posterior to clavicle and then descend into axilla.

CORDS:

The six divisions make up the lateral, medial and posterior cords. The cords are named according to relationships to the axillary artery.

Lateral cord -Formed by the union of ventral division of the upper & middle trunks.

Medial cord - Continuation of anterior division of lower trunk.

Posterior cord- Formed by the union of posterior division of all the three trunks.

TERMINAL BRANCHES:

Lower down in the axilla the cord gives rise to terminal branches namely the ulnar, medial and radial nerves.

(1). Branches of the roots:

1. Nerve to serratus anterior (Long thoracic nerve of bell) C5,C6,C7
2. Nerve to rhomboids (Dorsal scapular nerve)

(2) Branches of the trunk: These arise only from upper trunk which gives rise to two branches.

1. Suprascapular nerve (C5, C6)
2. Nerve to subclavius (C5, C6)

(**3) Branches of the cord:**

1. Lateral cord:

    (1).Lateral pectoral nerve (C5, C6,C7)

    (2).Lateral root of Median nerve (C5,C6,C7)

    (3).Musculocutaneous nerve (C5, C6,C7)

2. Medial cord:

    (1).Medial pectoral nerve C8, T1)

    (2).Medial cutaneous nerve of arm (C8, T1)

    (3).Medial cutaneous nerve of forearm (C8, T1)

    (4).Ulnar nerve (C8, T1)

    (5). Medial root of Median nerve (C8, T1)

3. Posterior cord:

    (1).Upper subscapular nerve (C5, C6)

    (2). Lower subscapular nerve (C5, C6)

    (3). Nerve to Lattismus dorsi (C6,C7,C8) (Thoraco dorsal nerve)

    (4).Axillary nerve (C5, C6)

    (5). Radial nerve (C5,C6,C7,C8 ,T1)

In addition to branches of brachial plexus:

1. Upper limb also supplied near trunk by supraclavicular branch of cervical plexus.
2. By the intercosto brachial nerve of 2^{nd} intercostal nerve.
3. Sympathetic nerves are distributed through the brachial plexus.

RELATIONSHIP OF THE BRACHIAL PLEXUS

ROOTS:

The roots are exists between the anterior scalenus and medius scalenus muscles. It is situated cephalo posterior to the second part of subclavian artery. This is the important landmark for Classical interscalene block.

TRUNKS:

In the posterior triangle, upper and middle trunks lies above the subclavian artery as they pass across the first rib, but the lower trunk passes behind the artery. The trunks are superficially covered by the skin, platysma and deep fascia. Trunks are crossed by external jugular vein, inferior belly of omohyoid and supraclavicular nerves. The trunks are easily identified by palpation. This is the landmark for perivascular approach of brachial plexus block.

DIVISIONS:

The divisions originates from the trunks at the level of lateral edge of first rib and lies behind the clavicle, and then descends into axilla. This is the land mark for blockade using rib hitching technique.

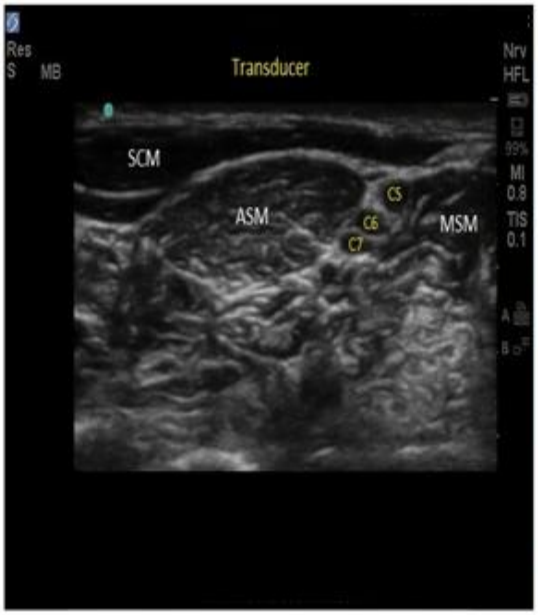
CORDS:

The cords are formed at the apex of axilla. The lies around the axillary artery. The medial cord lies posterior to the artery, but the posterior and lateral

cords lies lateral to the artery. The infraclavicular approach causes the blockade at the junction of divisions & cords.

TERMINAL BRANCHES:

Formation occurs in the axilla, in the lateral aspect. Radial, ulnar and median nerves are blocked by the axillary approach.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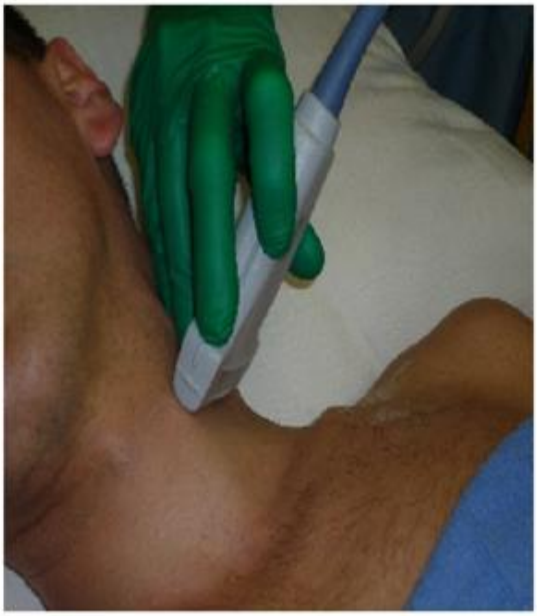
C6
C7




LATERAL
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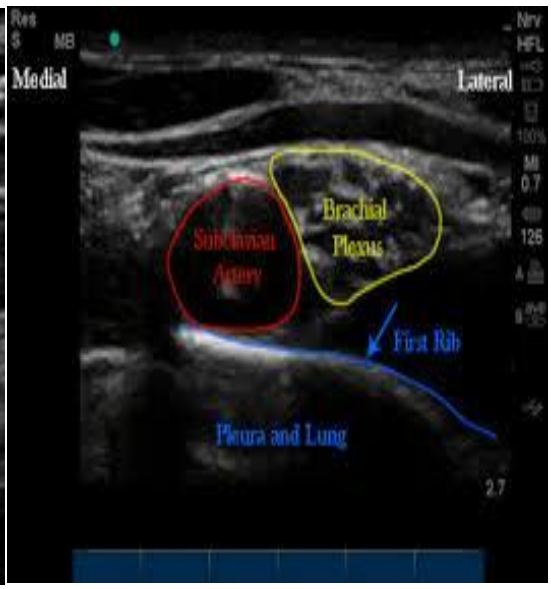

Medial
Lateral
Subclavian Artery
Brachial Plexus
First Rib
Pleura and Lung

SONOANATOMY OF BRACHIAL PLEXUS.

Ultrasound is a recently growing popular technique for regional anesthesia. Ultrasound guided peripheral nerve blockade first demonstrated in supraclavicular region by La Grange and colleagues in 1978. Later developed by Kapral et al 1994.

Advantages of supraclavicular block are that brachial plexus compact (proximal trunks and distal division) structures are shallow and easily visible[4,5].

Advantages of Ultrasound:

1. Enabling real time visualization of (1)plexus (2)rib (3)pleura (4)pulsating subclavian artery.
2. Increase in safety because of ability to visualize the needle placement and local anesthetic spread observed during the injection and enables further needle repositioning if required.
3. Increase in speed of onset of nerve block during drug deposition near the plexus.
4. Lesser volume drug is needed.

Structural characteristic in ultrasound:

1. Subclavian artery pulsation should be appreciated.
2. First rib is seen as linear hyperechoeic structure.
3. Parietal pleura identified by its hyperechoeic nature, its movement with respiration (that is called Sliding sign) and by its position lateral and medial to the first rib.

4. Lung tissues are deep to the plexus.
5. Brachial plexus can be seen in between scalenus muscle and lateral and superior to subclavian artery as hypoechoeic round nodules. Eg (Honey combs (or) bunch of grapes) at 1-2 cm depth.

TECHNIQUE

TECHNIQUE

Divided into a series of steps (four “P” s)

1. Preparation
2. Positioning
3. Projection
4. Puncture

PREPARATION:

Informed consent must be obtained with adequate documentation of the risk and complications.

PREPARE THE O.T:

I. Anesthesia machine check.

II. Resuscitation equipment, laryngoscope, endotracheal tube, gum elastic bougies (GEB) and LMA.

III. Keep ready the emergency drugs (preloaded syringes) like

1. Inj.Adrenaline
2. Inj.Atropine
3. Inj.Midazolam
4. Inj .Dopamine
5. Inj.Dobutamine
6. Inj.Thiopentonesodium and general anesthesia drugs.

IV. Ultrasound machine and probe check (Linear probe 7 MHZ).

V. Check the monitors (ECG,NIBP,Sp02 and $ETCO_2$).

PROCEDURE TABLE:

1. Sterile bowl- 3
2. Sterile drape sheet
3. Pair of sterile gloves
4. Betadine solution
5. Sterile transparent sheet for covering the ultrasound probe.
6. Sterile jelly
7. Local anesthetic agent
8. Syringes 10ml X 2No.s,5 ml X 2 No.s,2ml X 1 No, 5cmX 2
9. 22 gauge needle

Following should be loaded in to an identical Syringe.

1. 35 ml of 0.5 % Ropivacaine
2. Clonidine 1ml (150 mcg)
3. Normal saline.

PREPARE THE PATIENT:

- Preoperative assessment
- Premedication
- Ensure adequate fasting

POSITIONING:

Position should allow comfortable placement of patient in supine position in O.T table with arm placed by side. Head is positioned without head rest and head turned 45 degree opposite side. Using high frequency (7.5 MHz) Ultrasound transducer, needle advancement is done.

PROCEDURE:

Goal: Placement of needle into brachial plexus sheath near the subclavian artery. Ultrasound visualization of the local anesthetic spread and displacement of trunk and divisions.

1. After proper positioning, skin preparation done with betadine and draping with sterile transparent sheet, Transducer is placed in coronal plane just above the clavicle at approximately its midpoint.(Land mark: subclavian artery, scalenus muscle, first rib).
2. The transducer should be targeted acutely down the neck, as if scanning the image deep to the thorax. Do not aim with probe across neck.
3. Attempt to scan the subclavian artery: Artery is hypoechoeic (or) black circle, pulsation is visible. The artery lies on the hyperechoeic line of first rib or pleura. If unable to visualize the artery, slide the probe medially (or) laterally parallel to clavicle. Scanning to be done cautiously, to avoid inadvertently mistaking the carotid artery for subclavian artery.

4. Brachial plexus is situated posterior and lateral to the artery (or) superior to the artery, looks like bunch of grapes, hypoechoeic structure encases hyperechoeic fascia.
5. Before insertion of needle, change to color Doppler to differentiate blood vessel (either artery or vein) and visualize the needle pathway.
6. Inplane technique, needle placed medial to lateral (or) lateral to medial towards and underneath the transducer.
7. Needle should be advanced at the junction of the artery and rib. Ensure needle does not cross beyond the hyperechoeic line (pleura, rib).
8. After the Local anesthetic injection, plexus will separate away from the artery and is displaced.
9. Remaining LA injected on the superficial aspect of the plexus after needle realignment.

PHARMACOLOGY

PHARMACOLOGY

ROPIVACAINE

It is a newer amide, chemical congener to Bupivacaine and Mepivacaine, long acting, belongs to Local anesthetic group, the pipecoloxylide, propyl group in piperidine N2 atom compared to Bupivacaine –butyl group. Pure S-enantiomer and is mainly used for intraoperative anesthesia and post operative analgesia[17,18,19].

PHYSICAL PROPERTIES:

The drug solution is a sterile, isotonic, isobaric, aqueous solution, free from preservatives, stereospecific structure.

- **Ropivacaine** - Pure S enantiomer, differ from Bupivacaine

Molecular formula : $\mathbf{C_{17}H_{26}N_2O}$

Molecular weight: 274.4 g/mo

Pka 8.07

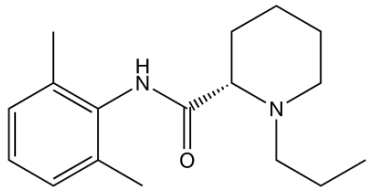


Figure-1:Molecular Structure of Ropivacaine

Rotation of the plane of a polarized light into,

- (R+) - Clock wise rotation (Dextro rotatory stereoisomers).
- (S-)-counter clock wise rotation (Levo rotatory stereoisomers).

These R+ and S- enantiomers have been different affinity for varying ion channels of Na^+, K^+ and $Ca2^+$.

Ropivacaine also has less lipid solubility →reduce CVS and CNS toxicity.

MECHANISM OF ACTION:

Ropivacaine causes reversible blockade of impulse propagation along the nerve fibre by preventing the inward movement of sodium channel through cell membrane. This action is also augmented by dose dependent inhibition of potassium channels. Ropivacaine has less lipid solubility than Bupivacaine.

Ropivacaine has a differential blocking effect on nerve fibres when lowest concentration is used, good differentiation between sensory and motor blockade. Motor blockade is of slower onset and shorter duration of as compared to Bupivacaine.

PHARMACOKINETICS:

All metabolites of Ropivacaine possess a local anesthetic effect with much lesser potency and shorter duration when compared to the parent compound.

The plasma concentration depends on the,

1. Injection of total dose
2. Route of injection
3. Patient hemodynamic and circulatory status
4. Vascularity at the site of injection.

Ropivacaine follows linear pharmacokinetics and the C max is proportional to dose. Ropivacaine inject into the epidural space absorption is biphasic and complete with approximate half-life 14min and slower phase T 1/2 4.2 hours.

Absorption is the rate limiting factor in elimination of Ropivacaine. The elimination half time life is longer after epidural route than after intravenous route. Terminal half-life is1.8 hour after Intravenous administration.

Ropivacaine is mainly bound to α 1 acid glycoprotein in plasma (94%) and unbound fraction 6 %.

METABOLISM AND EXCRETION:

Ropivacaine is extensively metabolized in liver.

- Mainly aromatic hydroxylation to 3-OH- Ropivacaine by cytochrome P450 enzyme.
- N-dealkylation to 2'6 pipecoloxylide, 4 Hydroxy– de alkylated account for 1-3% conjugated and unconjugated 3-OH Ropivacaine.
- Ropivacaine is mainly excreted via the renal system after a single Intravenous dose.

PHARMACODYNAMICS:

Ropivacaine is less lipid soluble than Bupivacaine and has stereoselective property. It has lesser cardio toxicity and CNS toxicity in animal study and also human volunteers.

Other effects: It inhibit platelet aggregation in plasma concentration 3.75–1.88mg/ml. It has antibacterial activity in vitro.

POTENCY:

Lipid solubility is the important factor responsible for potency of drug.

Ropivacaine has similar potency as compare with Bupivacaine at higher doses and lesser potency in lower doses.

TOLERABILITY:

Ropivacaine is well tolerated. Tolerability does not depend on route of administration.

CVS adverse event may be age related. Patient age >60years in epidural route increases the incidence of bradycardia.

Inadvertent I.V injection of Ropivacaine causes lower incidence of CVS & CNS toxicity as compared to Bupivacaine.

DRUG INTERACTION:

Ropivacaine extensively metabolized by cytochrome P450 1A2to 3OH Ropivacaine.

Drugs that inhibit Cytochrome P450 (fluvaxamine)-given concurrently with Ropivacaine increase plasma level of Ropivacaine.

Competitive inhibition occurs with concurrent administration of Theophylline and Imipramine. So Ropivacaine should be used cautiously when used with cytochrome P 450 enzyme inhibitors.

DOSAGE:

In peripheral nerve block , Concentration 0.5% (or) 0.75% can be used .

- Volume 0.6 ml/kg
- Dose 3 mg/kg

INDICATIONS:

Surgical anesthesia

- Epidural blocks
- Intrathecal block
- Major nerve blocks
- Field blocks.

Acute pain management:

- Continuous epidural infusion and intermittent bolus administration for postoperative pain and labour analgesia.
- Continuous peripheral nerve block by continuous infusion.

ADVERSE EFFECTS:

Most common side effects are

- Hypotension
- Nausea
- Vomiting
- Head ache
- Bradycardia
- Urinary retention.

CLONIDINE HYDROCHLORIDE

It is the first α adrenoreceptor agonist tested as nasal decongestant. Used as an antihypertensive agent in late 1960.

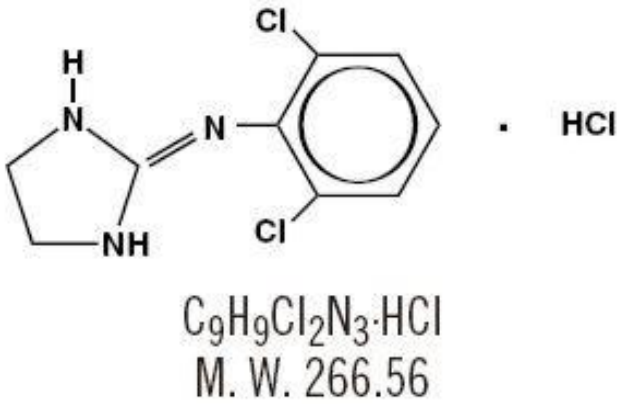
Clonidine Hcl is a selective α 2 adrenergic agonist, central sympatholytic agent. It decreases sympathetic output from CNS via agonist action on α 2 receptor.α 2: α1 selectivity is of the ratio 200:1[17]

CHEMISTRY:

It is an Imidazolone derivatives existing as a mesomeric compound. It is an odourless, bitter, white crystalline substance soluble in water & alcohol.

- Molecular formula : $C_9H_9Cl_2N_3.Hcl$
- Molecular weight: 266.56
- Pka 8.2

Figure2: MOLECULAR STRUCTURE OF CLONIDINE HYDROCHLORIDE



STORAGE:

The dose should be kept in closed container, protected from sunlight.

PHARMACOKINETICS:

After oral absorption →Bioavailability 75-100% because of ether lipid solubility.

- VD: 2.0-3.42L/kg Bwt.

Peak plasma concentration attain in 60-90 min.

Described by two compartment models

1. Rapid distribution phase→ 10 Min
2. Slow elimination phase→ 8-13 Hr

Total body clearance 3.05-4.85ml /kg/min

After absorption, 50% metabolism takes place in the liver.

Clonidine is converted into an inactive metabolite (Hydroxy clonidine) and 40-50% is eliminated via the kidney in the unchanged form.

Lipid solubility → Clonidine penetrates BBB, Extravascular site and fetal circulation.

Plasma binding capacity 20-40%.

TRANSDERMAL PATCHES:

Drug released gradually in steady state and attains the Therapeutic level after 48-72 hrs. TDP Causes lesser side effect when compared to oral route.

MECHANISM OF ACTION:

Clonidine was originally used in hypertensive treatment. Nowadays, it is extensively used as an adjuvant in anesthesia practice in Central neuro axial block and peripheral nerve blockade.

CNS: Clonidine has agonist action on α 2 receptor in pons (locus ceruleus).

There are three type of alpha 2 receptors.

- Alpha 2 A→Sedation, analgesia & sympatholysis.
- Alpha 2 B→Vasoconstriction and Antishivering effect.
- Alpha 2 C→Startle-response.

Clonidine→Stimulates α 2 adrenergic -inhibitory neurons in vasomotor centre, resulting in reduce central sympathetic outflow to the peripheral tissues and causes peripheral vasodilatation ,resulting in decreased SBP, HR and CO.

Clonidine modifies the K^+ channel function in neuron, thereby decreasing anesthetic requirement.

CARDIOVASCULAR EFFECT OF CLONIDINE:

- Decreases SBP> DBP
- Decreases CO initial treatment –return to normal in pre drug level.
- Systemic vascular resistance is little affected.
- Homeostatic cardiovascular reflexes - maintained by Clonidine resulting in reduced incidence of orthostatic hypotension during exercise.
- Renal blood flow and GFR are maintained in Clonidine therapy.

RESPIRATORY EFFECT:

Incidence of respiratory depressant effect is less in Clonidine. It does not potentiate the opioid induced respiratory depression.

ANESTHETIC APPLICATION OF CLONIDINE:

Clonidine is widely used as an adjuvant in Central neuroaxial block & peripheral nerve block.

REGIONAL ANESTHESIA(CNB):

Addition of clonidine 75-100 µg -with Tetracaine (or) Bupivacaine placed in Intrathecal space.

Shorten the onset time of sensory & motor block and prolongs the duration of both sensory & motor block.

Inhibit spinal substance P release and nocioceptive neuron firing to noxious stimulus.

MECHANISM:

It enhances the post synaptic action of **α**2 receptor in substantia gelatinosa of spinal cord.

It produces analgesia: Also due to conduction block in A delta & C fibres.

PERIPHERAL NERVE BLOCK:

Clonidine acts as an adjuvant with Ropivacaine LA agent & improves the quality of nerve block.

Mechanism of action:

1. Vasoconstriction→Increases the concentration in nerve fibres exposed & lowers the plasma concentration.
2. Spinal action caused by retrograde axonal transport of nerve impulse.
3. It enhances the Na^+ channel blocking action of Local anesthesia by opening K^+ channel. Hyperpolarisation of membrane results in unresponsiveness to excitatory input.

ADVANTAGES OF ORAL CLONIDINE:

At a dose of 180-200mg given 1Hr before spinal anesthesia with Tetracaine and Lidocaine, results in prolonged duration of sensory & motor block.

Mechanism of oral clonidine that prolongs the spinal anesthesia remain unclear .Clonidine premedication increases the risk of clinically significant hypotension & bradycardia.

Premedication dose: 5 μg/kg BWt.

1. Attenuates the intubation response (tachycardia and hypertension) during laryngoscopy and intubation to trachea.
2. Controls intraoperative BP & HR

3. Reduces plasma catecholamine level resulting in reduced surgical stress response.
4. Reduces MAC (inhaled anesthetic drug requirement)
5. Clonidine prolongs the postoperative analgesia – intrathecal morphine with local anesthesia without increasing the side effect of opioid .

Clonidine is used to control perioperative shivering by inhibiting central thermoregulatory temperature control and also inhibiting hypothermia induced vasoconstriction.

DOSAGE:

Premedication dose: 5 µg/kg BWt.

Epidural → 5 µg/kg BWt.

Spinal→ wide range 15-150 µg/kg BWt.

Peripheral nerve block→ 1 µg/kg BWt.

DRUG INTERACTION:

Tricyclic antidepressant – Phenothiazine and butyrophenones interfere with clonidine action.

TCA→ Hypotensive effect of clonidine is reduced, so increase the Clonidine dose.

SIDE EFFECTS:

Monitor Heart rate, In patients on calcium channel blockers, β-blockers, digoxin, severe bradycardia can develop.

ADVERSE EFFECTS:

Most common symptom is dry mouth, constipation,dizziness, sedation, fatigue, fever, pallor, weakness, withdrawal syndrome, weakly positive Coombs test and increase sensitivity to alcohol.

CVS: Bradycardia, CCF, Junctional bradycardia, high degree AV block

ORTHOSTATIC SYMPTOMS:

Palpitation, syncope, tachycardia, Raynauds phenomenon.

CNS:

Anxiety, agitation, delirium, hallucinations (Auditory & visual), insomnia, mental depression.

DERMATOLOGICAL:

Alopecia, pruritus, rash, utricaria

GIT:

Abdominal pain, nausea, vomiting, pruritus, colonic pseudo obstruction, mild elevation of LFT

HEMATOLOGICAL:

Thrombocytopenia

METABOLIC :

Gynaecomastia, transient elevation of blood glucose level.

GENITOURINARY:

Decrease sexual activity

Erectile dysfunction

Loss of libido

Nocturia

Urinary retention

OPTHALMOLOGICAL:

Dry eye

Blurred vision

No specific antidote available to treat clonidine toxicity & over dose.

Aptimezole can be tried in dexmeditomidine and also in clonidine toxicity.

MATERIALS AND METHODS

MATERIALS & METHODS

After getting approval from the Institutional ethical committee of Mahatma Gandhi memorial Government Hospital, 60 patients were selected. They were randomly divided into two groups of 30 patients each.

The patient's aged between 18-60yrs with American Society of Anesthesiologist grade I & II, scheduled for various elective surgeries lower arm, at the level of elbow, forearm & hand were included in the study.

The study was designed as a prospective randomized double blind placebo controlled study.

Exclusion criteria:

1. Patient refusal.
2. Patient age < 18 years (or)> 60 years.
3. Patient under anticoagulant drugs.
4. Coagulopathy bleeding diathesis.
5. H/o allergy to study drugs.
6. H/o hypertension.
7. H/o peripheral neuropathy.
8. H/o brachial plexus injury.
9. Systemic infection (or) Infection at the site of injection.
10. Bilateral upper limb fracture.

Patients were allocated into two groups by computer randomization table.

Group RC→ (n=30) received 175 mg of 0.5% Ropivacaine (35 ml)+ 1 ml of Normal saline → (36ml)

Group R→ (n=30) received 175 mg of 0.5% Ropivacaine (35 ml)+ 150 µgClonidine (1 ml) → (36ml)

(Clonidine150 µg ampoule, preservative free, Neon lab).

The study drug solution was prepared by my assistant professor who was not involved in this study.

Clonidine ampoule 1 ml contains 150 µgm was mixed with 35 ml of 0.5 % Ropivacaine to get final volume of 36 ml (B group).

1 ml of normal saline added to 35 ml of 0.5 % Ropivacaine to get total volume of 36 ml (A group).

Both anesthesiologist & patients were blinded to the study drugs.

Anesthesia technique:

In the preparation room, anaesthetic procedure and VAS score was thoroughly explained to the patients. After getting informed consent, patient shifted to operation theatre. Intravenous access secured with by 18 G I.V cannula in the non operating limb & Ringer lactate was started. Intraoperative standard monitor were attached. Baselines Heart rate, Blood pressure, oxygen saturation were recorded.

Under strict aseptic precautions supraclavicular brachial plexus block performed by **ultrasound guided approach** in plane technique.

After real time visualization of brachial plexus by ultrasound, needle was placed near the plexus, following negative aspiration of blood, drug solution was injected around the brachial plexus.

Time at the end of drug injection was taken as zero min.

Assessment of sensory block in the cutaneous distribution of M**usculocutaneous, Radial, median & Ulnar nerves** was assessed every 3 min by **pin pricking method.**

Sensory block onset was tested by using 23 G needle every 3 min until the feeling of dull sensation to pinprick. Complete sensory block known as Total loss of sensation to pin prick.

Grading of sensory block[20]:

- Grade 0: Sharp pin felt
- Grade 1: Analgesia, dull sensation felt.
- Grade 2: Analgesia, no sensation felt.

Motor blockade was assessed every 3 min by **"3 point modified bromage scale''** for upper limb.

Modified Bromage scale for upper limb[20]: (3 point scale)

- Grade 0: Normal motor function with full extension & flexion of elbow, wrist, finger
- Grade 1: Decreased motor strength with ability to move finger only

- Grade 2: Complete motor block with inability to move finger.

If any one of the nerve segment supply (Median, Radial, Ulnar Musculocutaneous nerves) did not get blocked even after 30 min after drug injection, the block was considered incomplete. These patient supplemented with Inj.Fentanyl 2 µgm/kg, Inj.Midazolam 0.03 µgm/kg and proceeded to surgery.

If remain more than one nerve segment was not anesthetized, the block considered as failed block. These patients under went general anesthesia.

Hemodynamic parameters such as Blood pressure, heart rate, Oxygen saturation every 15 min during the surgery and every 60 min postoperatively were monitored.

The blood loss & fluid status were assessed and replaced during the surgery.

Patient's sedation score was assessed by **Ramsay sedation score**[21]. The sedation score was assessed every 5 min during the surgery till it reached maximum level. In postoperative period, it was assessed every 30 min till the patient was fully awake.

Table 1: Ramsay Sedation Score

Score -To awake:

1	Anxious, agitated
2	Oriented and Cooperative
3	Responds to verbal commands

Score -To sleep:

4	Brisk response to light glabellar tap
5	Poor response to light glabellar tap
6	No response

Patients were assessed during surgery & post operatively by anesthesiologist who was unaware of the drugs given.

Post operative pain was assessed as per [22]Visual analogue score using word scale.

Visual Analogue Score:

Score

0 : Patients does not complaining of pain

1 -3 : Patients complaining of mild pain

4-6 : Patients complaining of moderate pain

7-8 : Patients complaining of severe pain

9-10 : Patients complaining of excruciating pain

(VAS) score recorded every 60min after the surgery (post operative period) till the score reached 4. If the score reached 4, Rescue analgesia was given in the form of Inj.Diclofenac 1.5 mg/ kg i.m.

During intra operative & postoperative period all the patients were observed for any side effects like dry mouth, nausea, vomiting, sedation & complications like Pneumothorax, Local anesthesia toxicity, hematoma at the site of injection .

Sensory block duration: from the time of injection of study drug solution to complete sensory recovery of all nerves.

Motor block duration: Time interval between the injection of study drug solution to complete recovery of motor function of hand & forearm.

Primary outcome:

Onset & duration of sensory and motor block.

Duration of analgesia.

Secondary outcome:

Sedation Score

Occurrence of any side effects & complications.

Statistical Analysis:

The observed data were recorded in excel sheet .Statistical Analysis was done with (Statistical package social science) SPSS-16 version.

Qualitative data like Categorical data (sex, ASA status) and side effects including dry mouth, nausea, vomiting and head ache were calculated as percentage and proportions. These data were analyzed by Chi-square test .

Quantitative data like time of onset of sensory & motor blockade ,duration of sensory and motor blockade and duration of analgesia were expressed as mean ±SD .These data were analyzed by unpaired student " t " test .

Sample size calculation:

Sample size was calculated using prior power analysis. We did a pilot study in which the average mean in the onset of sensory blockade for Ropivacaine plus clonidine and Ropivacaine plus normal saline were 6.55 min and 15.85 min respectively. Average mean difference was found to be 9.3 min and the standard deviation was 5.7.

With available variables and assuming 95% confidence limits and Alpha error of 0.05 and Beta error of 0.10,we calculated 28 patients for each group and allowing for the dropouts and mishaps we arrived at a sample size of 30 for each group.

OBSERVATIONS AND RESULTS

OBSERVATIONS AND RESULTS

Demographic profile:

Demographic characteristics like Age, Sex, Weight and ASA status were comparable among the two groups. There was no statistically significant difference noted between these demographics.

TABLE 2: DEMOGRAPHIC PROFILE BETWEEN RC AND R GROUP

Demographic profile	**Group RC**	**Group R**	***P* value**
Sex(Male: Female)	18:12	20:10	0.437
Mean age(Years)	36.77±11.913	39.20±12.169	0.599
Mean weight(Kg)	59.33±9.245	55.47±8.244	0.068
ASA status(%)1:2	48.2% : 75.00%	51.8 : 25.00%	0.301

ONSET OF SENSORY BLOCK

The mean time of onset of sensory block in group RC was 5.8 ± 2.72 min and in group R was 7.7±2.53 min.

FIGURE 3: ONSET OF SENSORY BLOCK (in min)

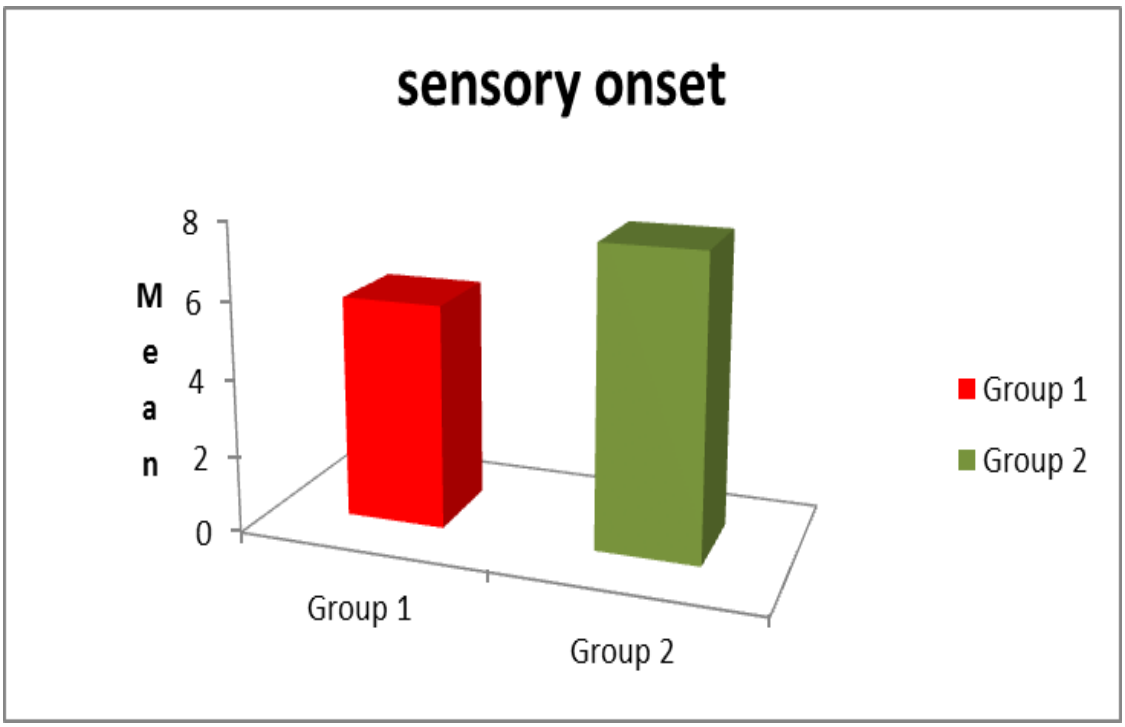


TABLE 3: SENSORY ONSET

Group	Mean±SD	T Value	P value	Significance
RC Group	5.8±2.72	2.298	0.007	HS
R Group	7.70±2.53			

The statistical analysis by student's unpaired "t" test showed that the sensory onset in RC group was much earlier than R group, which was statistically significant (P value 0.007).

ONSET OF MOTOR BLOCK:

The mean time of onset of motor block in group RC was 9.3 ± 2.72 min and in group R was 10.63 ±2.785min.

FIGURE 4: ONSET OF MOTOR BLOCK (in min)

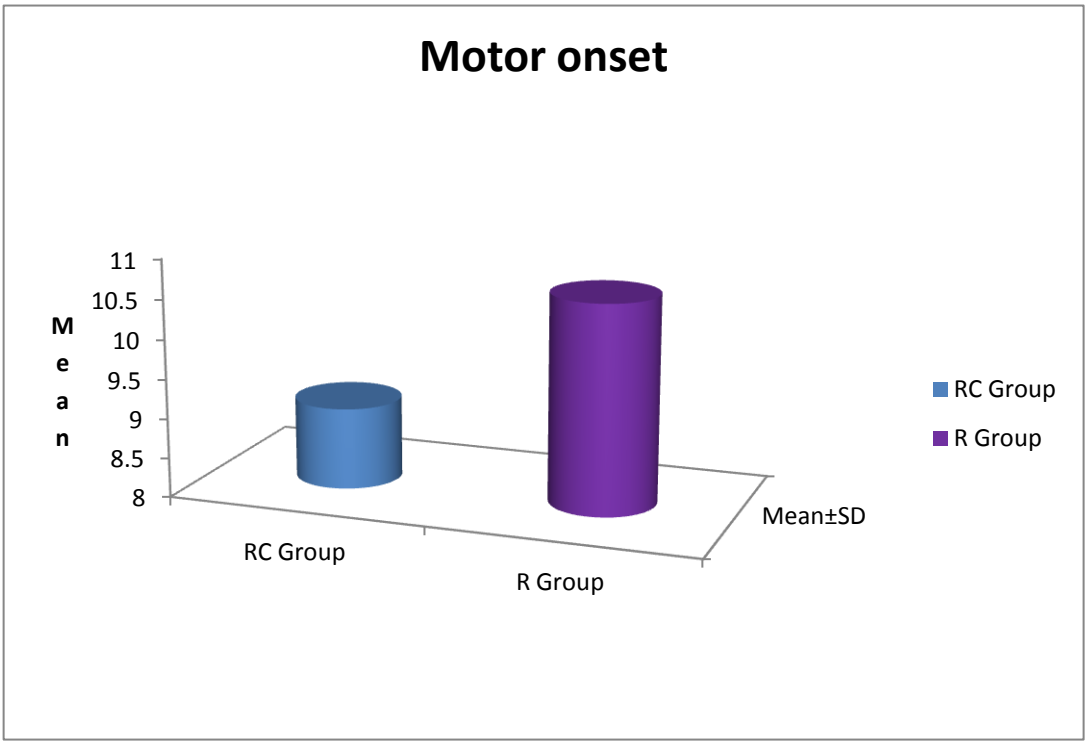


TABLE 4: MOTOR ONSET

Group	Mean±SD	T Value	P value
RC Group	9.03±2.72	2.086	0.05
R Group	10.63±2.785		

The statistical analysis by student's unpaired "t" test showed that the motor onset in RC group was much earlier than R group, which was statistically significant (P value <0.05).

DURATION OF SENSORY BLOCK:

The mean duration of sensory block in group RC was 534.67 ± 62.449 min and in group R was 44.50 ± 1.004 min.

FIGURE 5: DURATION OF SENSORY BLOCK .

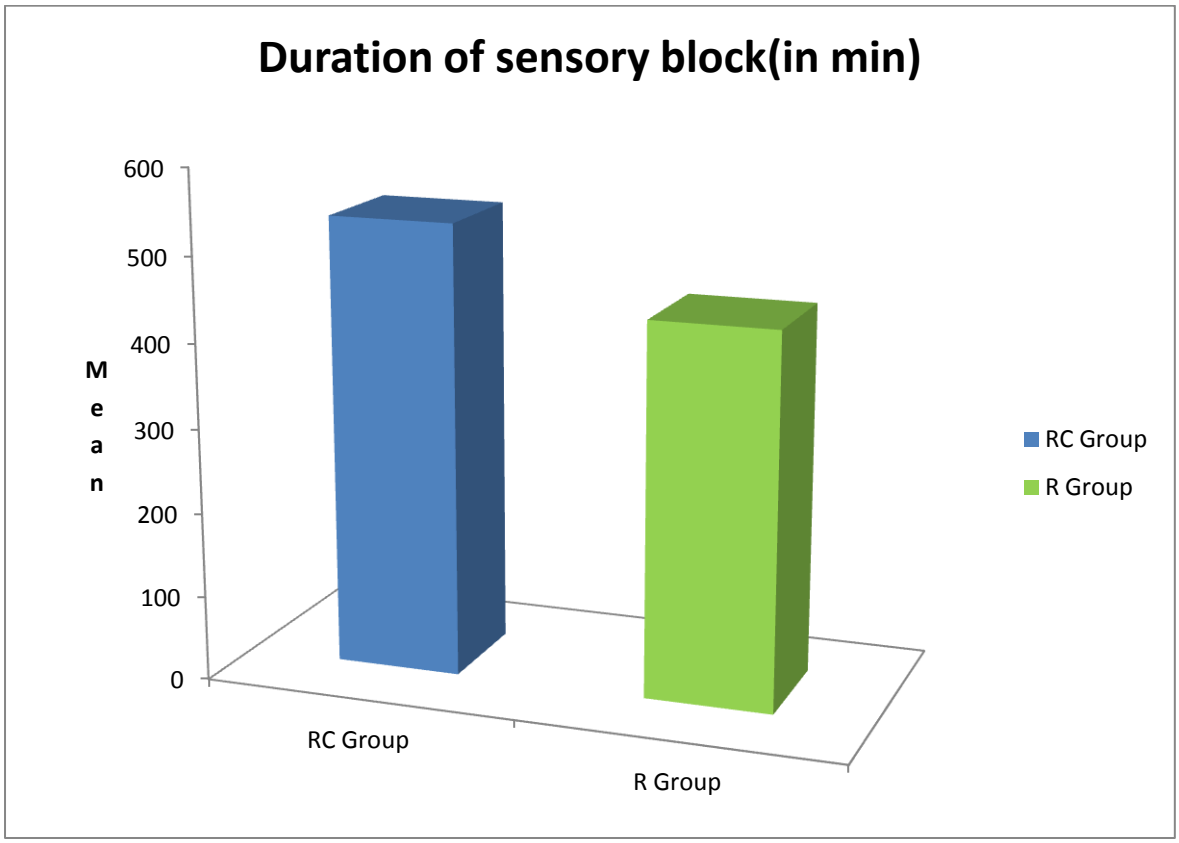


TABLE 5: DURATION OF SENSORY BLOCK (in min)

Group	Mean±SD	T Value	P value	Significance
RC Group	534.67±62.449	6.831	<0.001	HS
R Group	441.50±41.004			

The statistical analysis by student's unpaired "t" test showed that the mean duration of sensory block in RC group was prolonged than R group which was statistically significant (P value <0.001).

DURATION OF MOTOR BLOCK:

The mean duration of motor block in group RC was 498.00 ± 53.233 min and in group R was 400.67 ± 38.200 min .

FIGURE 6: DURATION OF MOTOR BLOCK

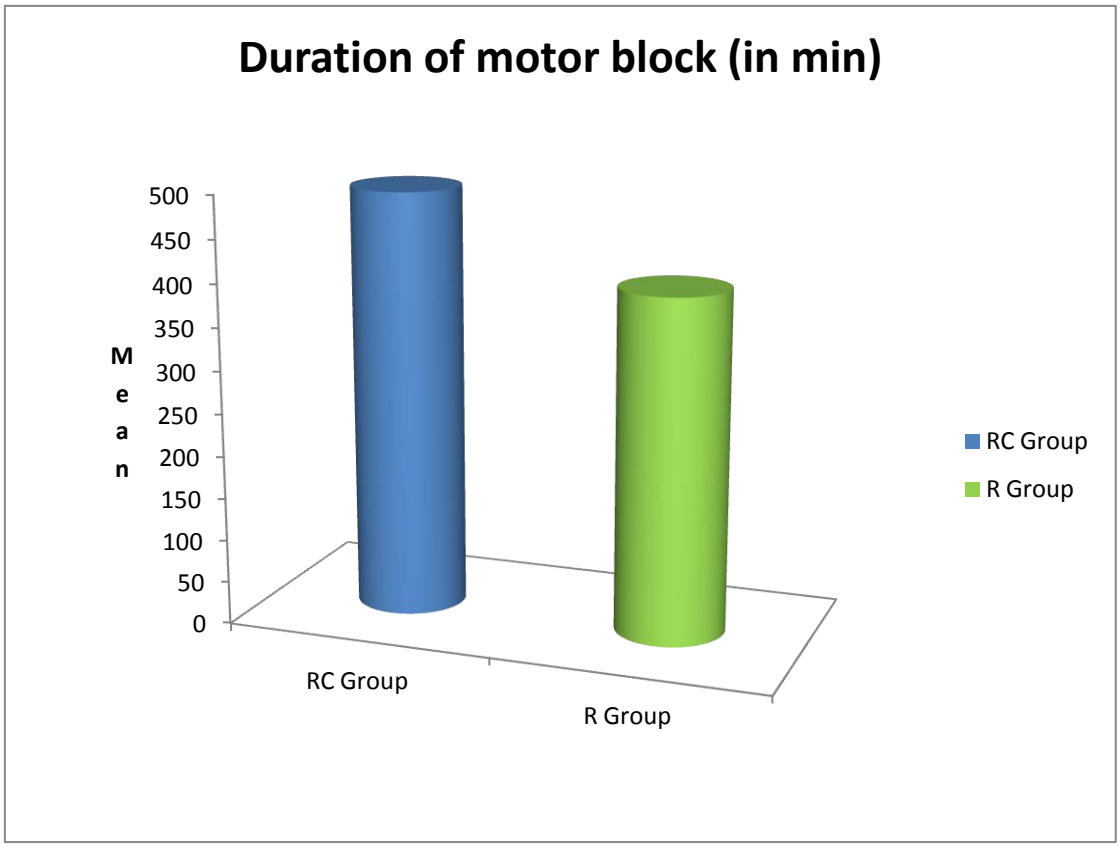


TABLE 6: DURATION OF MOTOR BLOCK (in min)

Group	Mean±SD	T Value	P value	Significance
RC group	498.00±53.233	8.136	< 0.001	HS
R Group	400.67±38.200			

The statistical analysis by student's unpaired "t" test showed that the mean duration of motor block in RC group was prolonged than R group, which was statistically significant (P value <0.001).

DURATION OF ANALGESIA:

Duration of analgesia was significantly prolonged in RC group (Ropivacaine and Clonidine) 656.7±86.256 min than control R group (Ropivacaine and NS) 502± 53.169 min, which was statistically highly significant (P< 0.001).

FIGURE 7: DURATION OF ANALGESIA

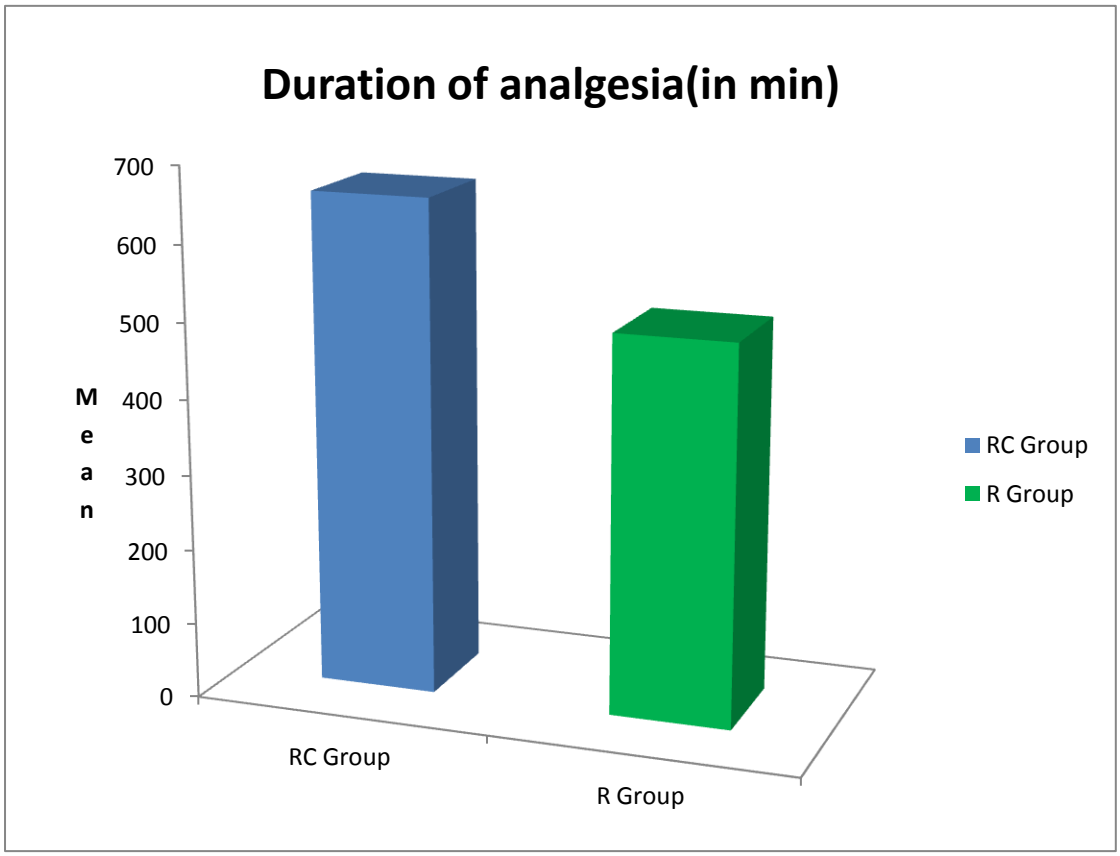
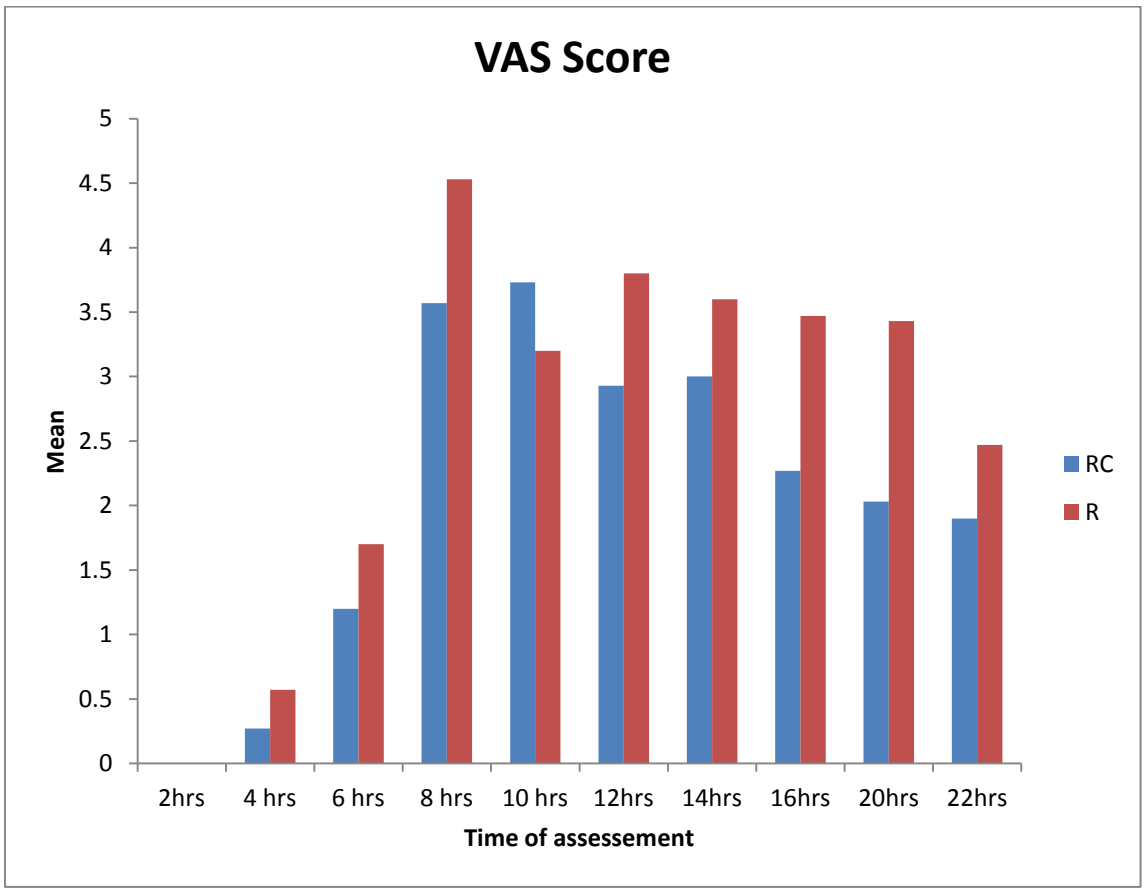


TABLE7: DURATION OF ANALGESIA (in min)

Group	Mean±SD	T Value	P value	Significance
RC Group	656.7±86.256	8.362	< 0.001	HS
R Group	502±53.169			

After the VAS score 4, Inj. Diclofenac 1.5 mg/Kg Bwt was given as rescue analgesia for all patients.

FIGURE 8: VAS SCORE



The pain score was observed at the end of surgery. At 2 hours the mean VAS score in both groups were zero. After 8 hours, the mean VAS score in RC group which was not statistically significant.

TABLE 8:VAS SCORE

VAS Score	RC		R		T value	P value	Significance
	Mean	SD	Mean	SD			
2hrs	0.000	0.000	0.000	0.000	0.000	0.000	NS
4 hrs	.27	.640	.57	.728	1.696	0.086	NS
6 hrs	1.20	1.031	1.70	1.179	1.749	0.472	NS
8 hrs	3.57	.817	4.53	.571	5.310	0.001	HS
10 hrs	3.73	.980	3.20	.845	.705	0.001	HS
12hrs	2.93	1.098	2.43	1.040	.724	0.001	HS
14hrs	3.21	.814	3.60	.759	2.461	0.017	HS
16hrs	2.27	1.388	3.47	1.074	3.745	0.001	HS
20hrs	2.03	1.474	3.43	1.074	4.207	0.001	HS
22hrs	1.90	1.668	2.47	1.074	7.085	0.001	HS

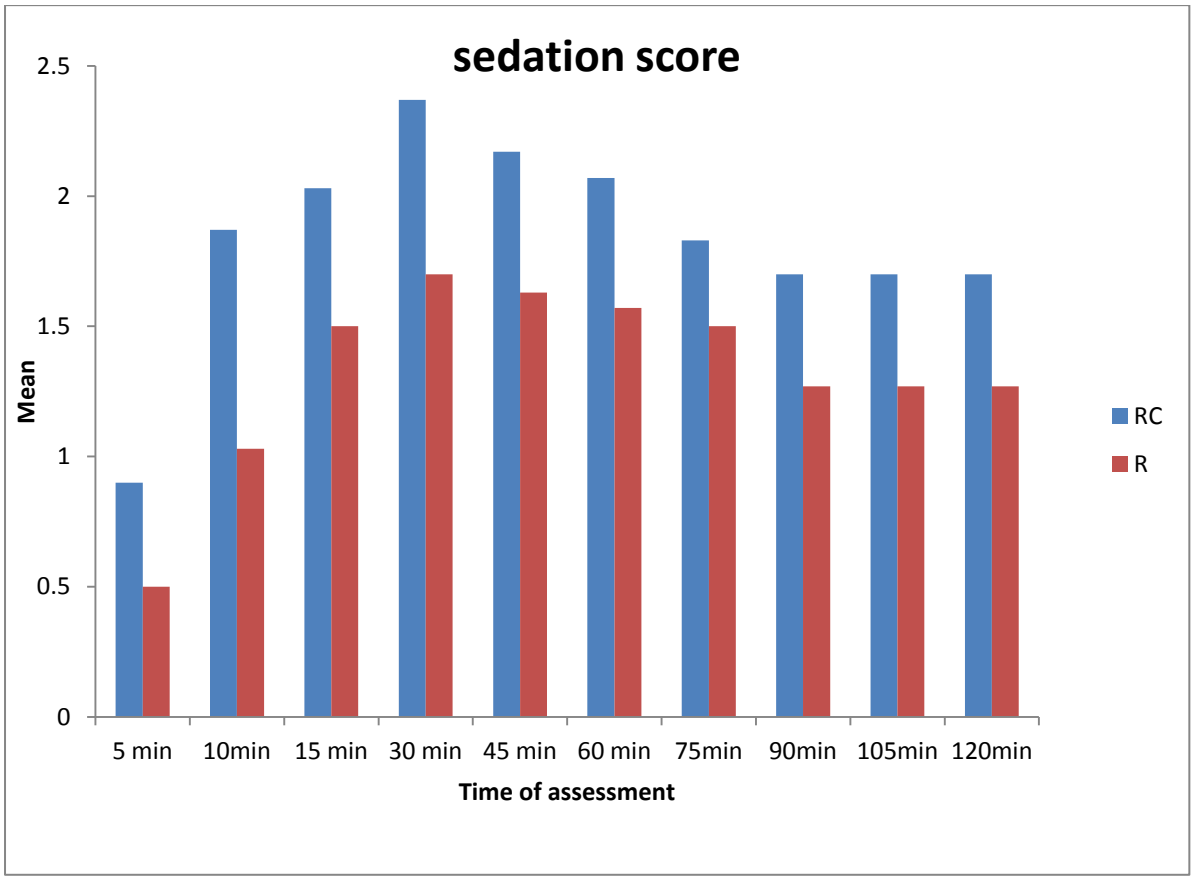
INTRA OPERATIVE SEDATION SCORE:

Sedation score was expressed as mean ±2SD and analyzed by unpaired student "t" test .Sedation score of patients was maximum at 30min in RC group 2.37±.669 and in R group 1.70± 0.466. There after the sedation score was decreased. The statistical analysis showed significant difference.

TABLE9: INTRAOPERATIVE SEDATION SCORE

Time of assessment	RC		R		T value	P value	Significance
	Mean	SD	Mean	SD			
5 min	.90	.481	.50	.572	2.931	0.005	HS
10min	1.87	.507	1.03	.850	4.610	0.001	HS
15 min	2.03	.556	1.50	.630	3.477	0.001	HS
30 min	2.37	.669	1.70	.466	4.480	0.001	HS
45 min	2.17	.699	1.63	.490	3.422	0.001	HS
60 min	2.07	.640	1.57	.504	3.363	0.001	HS
75min	1.83	.648	1.50	.572	2.112	0.039	HS
90min	1.70	.466	1.27	.583	2.115	0.039	HS
105min	1.70	.466	1.27	.583	3.176	0.002	HS
120min	1.70	.466	1.27	.583	3.179	0.002	HS

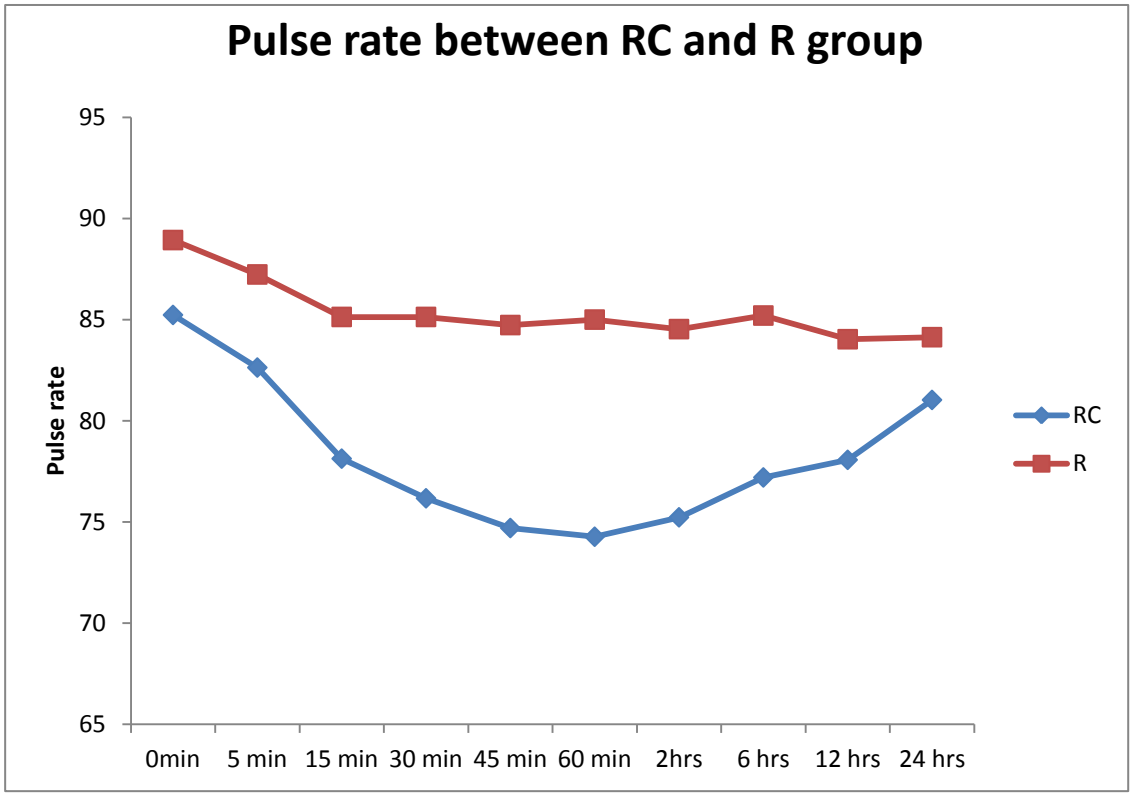
FIGURE 9: INTRAOPERATIVE SEDATION SCORE



HEMODYNAMIC VARIABLES:

Pulse rate, Systolic BP, Diastolic BP and Oxygen saturation were recorded at 0min, 5min, 15min, 30min, 45min, 60min, 2hrs, 6hrs, 12hrs and 24hrs after giving the block, throughout the surgery and postoperative period. These parametric data expressed as mean ± 2SD and further analyzed by student unpaired "t" test.

FIGURE 10: PULSE RATE



The mean pulse rate (Fig.10) at 30 min in RC group and R group were 76.17.and85.13 respectively whereas the mean pulse rate at 2 hours in RC and R groups were 75.23 and 84.53 respectively. Pulse rate was lower in RC group as compared with R group and statistically significant in 15min,30min,45min,60min, 2hrs, 6hrs 12hrs and 24hrs.

The statistical analysis showed significant difference, but none of the patients in RC group required Inj. Atrophine to maintain pulse rate

TABLE10: PULSE RATE

Time of assessment	RC		R		T value	P value	Significance
	Mean	SD	Mean	SD			
0min	85.23	9.726	88.93	5.265	1.832	0.072	NS
5 min	82.63	11.586	87.23	5.244	1.981	0.052	NS
15 min	78.13	11.135	85.13	5.740	3.896	0.001	S
30 min	76.17	11.876	85.13	5.740	3.723	0.001	S
45 min	74.70	11.441	84.73	5.740	4.328	0.001	S
60 min	74.27	10.719	85.00	6.103	4.766	0.001	S
2hrs	75.23	10.183	84.53	5.812	4.344	0.001	S
6 hrs	77.20	9.532	85.20	5.774	3.932	0.001	S
12 hrs	78.07	8.008	84.03	5.082	3.446	0.001	S
24 hrs	81.03	5.660	84.13	5.469	2.157	0.035	S

SYSTOLIC BP:

The mean systolic BP in RC group was between 114.07±9.318 mmHg to 124.93 ± 12.281 mmHg and in R group 113.33±6.065 mmHg to123.00±12.077 mmHg, the statistical analysis showed no significant difference among both groups examined (RC and R).

Mean systolic B.P at30 min in RC group was 114.07 mmHg.

Mean systolic B.P at30 min in R group was 113.47 mmHg.

Mean systolic B.P at 2hours in RC and R groups were 115.27 and 115.33 mmHg respectively.

The statistical analysis showed no significant difference.

FIGURE 11: SYSTOLIC B.P (mmHg**)**

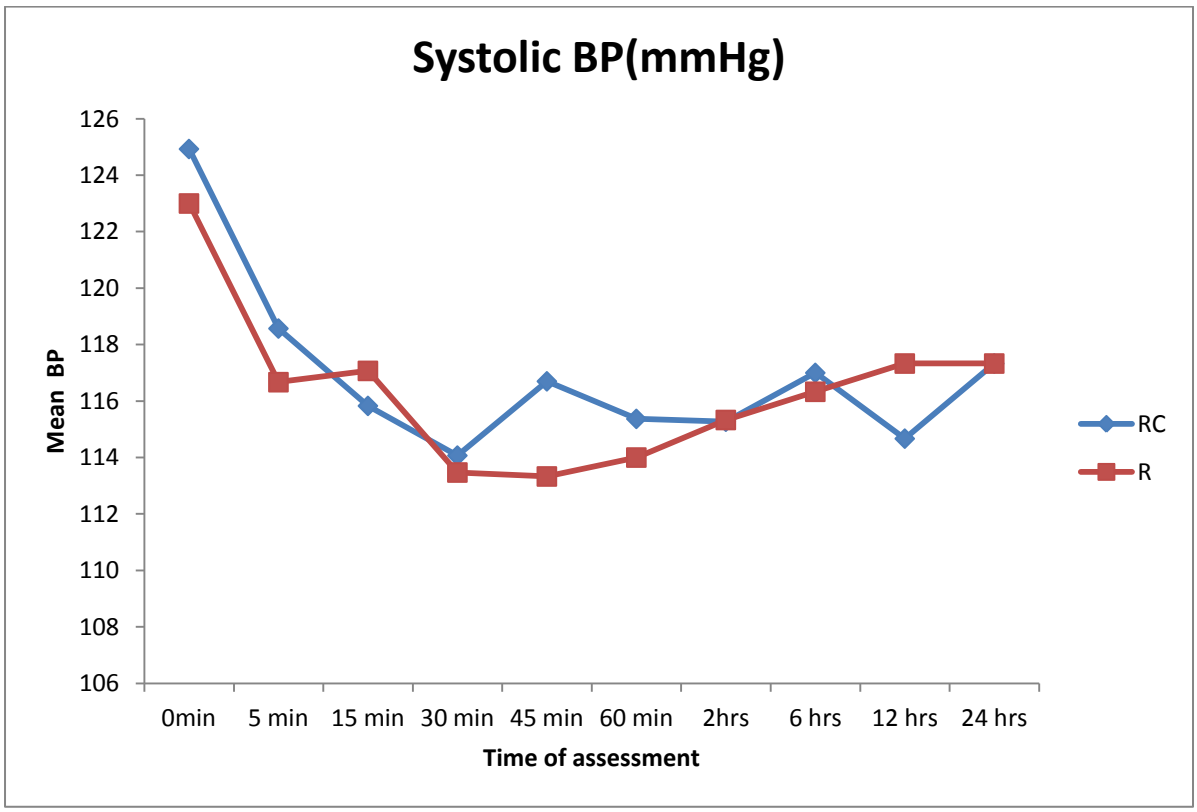


TABLE 11: SYSTOLIC B.P(mmHg)

Time of assessment	Systolic BP				T value	P value	Significance
	RC		R				
	Mean	SD	Mean	SD			
0min	85.23	9.726	88.93	5.265	1.832	0.072	NS
5 min	82.63	11.586	87.23	5.244	1.981	0.052	NS
15 min	78.13	11.135	85.13	5.740	3.896	0.001	S
30 min	76.17	11.876	85.13	5.740	3.723	0.001	S
45 min	74.70	11.441	84.73	5.740	4.328	0.001	S
60 min	74.27	10.719	85.00	6.103	4.766	0.001	S
2hrs	75.23	10.183	84.53	5.812	4.344	0.001	S
6 hrs	77.20	9.532	85.20	5.774	3.932	0.001	S
12 hrs	78.07	8.008	84.03	5.082	3.446	0.001	S
24 hrs	81.03	5.660	84.13	5.469	2.157	0.035	S

DIASTOLIC BP:

The mean diastolic BP in RC group was between 69.37±8.130mmHg to 80.10 ±7.818mmHg and in R group 70.33±8.503mmHg to78.33±8.339mmHg. The statistical analysis showed no significant difference among both groups examined (RC and R).

Mean Diastolic B.P at30 min in RC group was 69.37 mmHg.

Mean Diastolic B.P at30 min in R group was 71.17 mmHg.

Mean Diastolic B.P at 2hours in RC and R groups were 72.00 and 70.33 mmHg respectively. The statistical analysis showed no significant difference.

FIGURE 12: DIASTOLIC BP

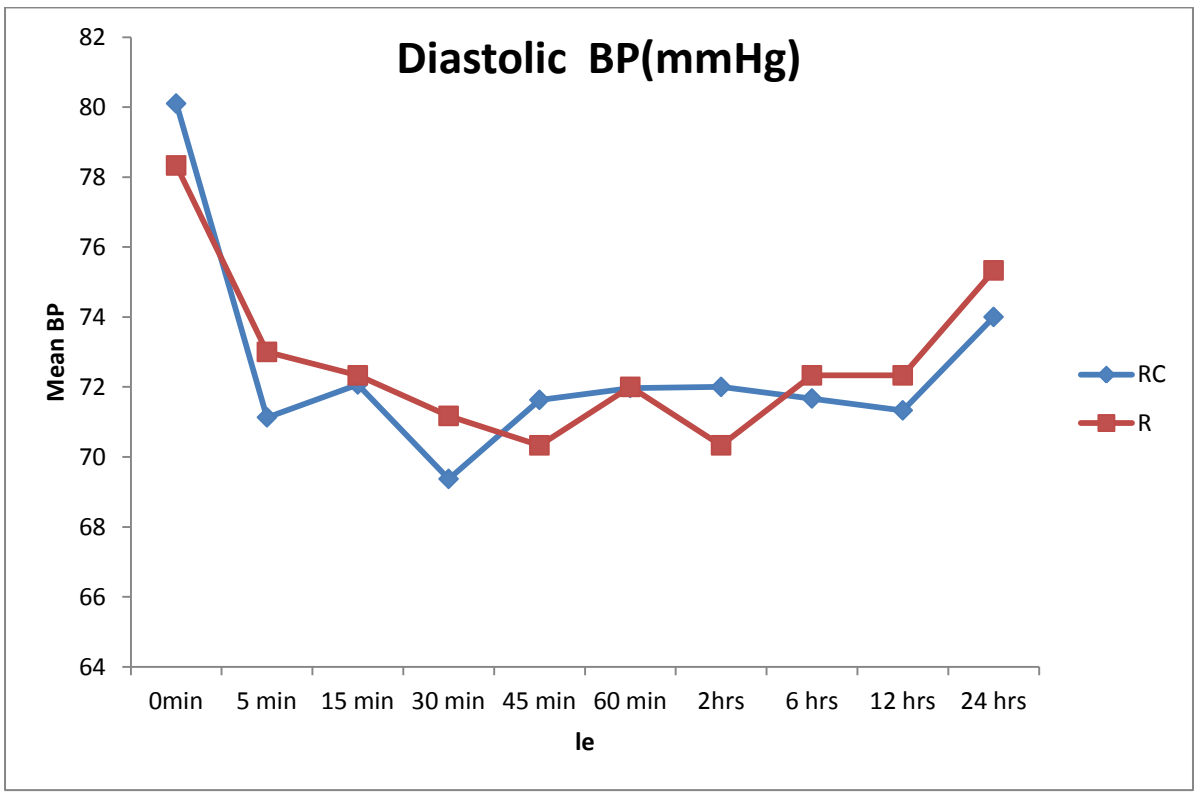


TABLE 12: DIASTOLIC B.P

Time of assessment	Diastolic BP mmHg				T value	P value	Significance
	RC		R				
	Mean	SD	Mean	SD			
0min	80.10	7.818	78.33	8.339	.847	.401	NS
5 min	71.13	9.372	73.00	9.523	.765	.447	NS
15 min	72.07	9.724	72.33	7.739	.818	.416	NS
30 min	69.37	8.130	71.17	8.477	.839	.405	NS
45 min	71.63	8.348	70.33	8.503	.598	.552	NS
60 min	71.97	8.560	72.00	7.611	.016	.987	NS
2hrs	72.00	8.867	70.33	8.503	.743	.460	NS
6 hrs	71.67	12.617	72.33	11.043	.363	.718	NS
12 hrs	71.33	8.604	72.33	11.043	.391	.697	NS
24 hrs	74.00	8.137	75.33	6.814	.668	.494	NS

OXYGEN SATURATION

Maximum and minimum oxygen saturation in RC group were found as follows 99.80±099.80% and 99.60± 0.675%, in R group was 99.33±0.606% and 99.47±0.507% respectively.

FIGURE 13: OXYGEN SATURATION

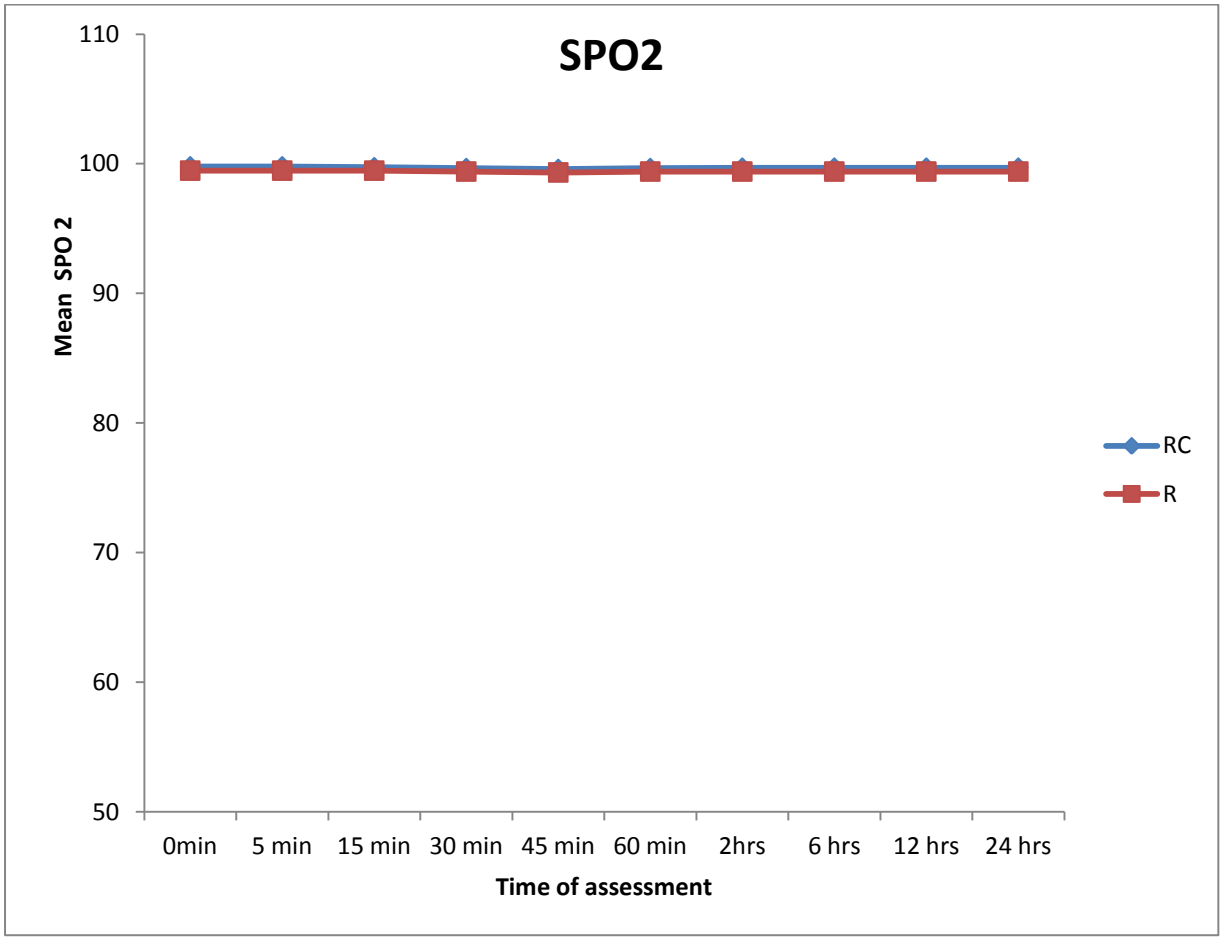


Table 13(a) : SIDE EFFECTS IN RC GROUP:

In RC group, 10 patients had dry mouth. None of the patient had headache, nausea or vomiting. Incidence of dry mouth was 16.4% in RC group which was highly significant.

Side effect	RC Group	Percent (%)
Dry Mouth	10	16.4%

In R group, only 3 patients had head ache, Nausea and Vomiting noted in 1 patient only. Incidence of Headache, Nausea and Vomiting were 4.9%, 1.6% and 1.6% respectively in R group which was not significant.

Table 13(b): SIDE EFFECTS IN RGROUP

Side effect	R Group	Percent (%)
Headache	3	4.9
Nausea	1	1.6
Vomiting	1	1.6

DISCUSSION

DISCUSSION

In our study, supraclavicular brachial plexus block was performed under ultrasound guidance. All the patients had successful brachial plexus block and hence satisfactory surgical anesthesia .

The real time ultrasound imaging showed better visualization of the brachial plexus, accuracy of the needle placement and spreading of Local anesthesia around the brachial plexus. Identification of the adjacent structures like blood vessels (Subclavian artery and vein), first rib and pleura was helpful to avoid procedure related complications.

We observed that 150 µg of Clonidine added to 175 mg of 0.5% Ropivacaine, resulted in excellent quality of supraclavicular brachial plexus block for upper limb surgeries.

The advantage of Clonidine added as an adjuvant to Ropivacaine was rapid onset and prolonged duration of sensory and motor blockade .It also prolonged the duration of postoperative analgesia.

Many adjuvants like Neostigmine, Opioids, Dexamethasone, Hyaluronidase were used with Local anesthesia in various peripheral nerve blocks to prolong the duration of analgesia, but the results have been inconclusive because of its doubtful efficacy and side effects.

In our study, we observed that onset time of sensory blockade was significantly decreased in RC group when compared to R group. The mean onset time of sensory blockade in RC group was (5.8± 2.72) min and in R

group (7.7±2.5) min. Sidharth SR et al. showed the mean onset time of sensory blockade in their study group was 10.44 ± 5.7 min and in control group was 15.85 ± 6.55 min[7].The delayed onset of sensory block in the study by Sidharth et al inspite of adding clonidine would have been due to the landmark technique used in administering the block. In our study we administered the block under ultrasound guidance which has helped in deposition of the local anesthetic in close proximity to the plexus contributing to the early onset of the sensory block.

The mean onset time of motor blockade in RC group was (9.3±2.72) min. as compared to R group (10.63±2.785) min which was statistically significant. Quazi et al .showed the mean onset time of motor blockade in study group (Ropivacaine 0.5% + 75 mcg clonidine) was 13 ± 3.69 min and in control group was 15.05 ± 4.21 min[6].

The reason for early onset of motor blockade in our study would have been due to accuracy of needle placements close to the plexus ,higher volume of local anesthetic (35ml instead of 30ml) and higher dose of clonidine (150 µg instead of 75 µg).

The mean duration of sensory blockade in RC group was (534.67±62.449) as compared with R group (441.50±41.004) min. The mean duration of motor blockade in RC was (498.00±53.233) min, compared with R group (400.67±38.200) min. Prolongation of sensory and motor blockade was in RC group was statistically significant. Our observation concur with those obtained by Quazi et al.

The duration of motor block was less than the sensory block due to increased requirement of local anesthetic for larger motor fibre than small sensory fibre. Gupta et al. have shown earlier onset of sensory and motor blockade and prolonged duration of sensory and motor blockade with Ultrasound Versus other nerve localization techniques[9].

The combined administration of clonidine and ropivacaine local anesthetics (synergistic mechanism) results in prolonged effect of sensory and motor blockade. This could be the only possible mechanism which explains the long lasting sensory and motor blockade[23].

Duration of analgesia was significantly prolonged in RC group than control R group which was statistically highly significant. Gupta et al showed the duration of analgesia in study group was 956.47 ± 38 min and in control group was 736.53± 47 min[9].

The mean duration of post operative analgesia in our study in RC group (656.7±86.256) min as compared with R group (502±53.169) min which was statistically significant. The prolonged duration of analgesia in RC group was due to synergistic effect of clonidine and ropivacaine.

The analgesic effect of clonidine may be due to anti nocioceptive action on α2 adrenoreceptor situated on brainstem nuclei locus cerulus and in neurons in the superficial Laminae of spinal cord. Central analgesic effect was due to systemic absorption of clonidine[12,17].

. "**Sia and Lepri**" observed the synergistic mechanism between clonidine and ropivacaine. This could be the probable cause of extended duration of analgesia in post-operative period[24].

Mechanism of action of Clonidine to enhance the peripheral nerve block by **"Vasoconstriction theory**"[23]α 2 Adrenergic stimulation causes decreased systemic absorption of Local anesthetics (Ropivacaine) and also Ropivacaine has an intrinsic vasoconstriction effect .This intrinsic vasoconstriction effect of Ropivacaine is not enhanced by Epinephrine[23].Clonidine has direct-action on A delta and C fibers and inhibits the nerve conduction, which further augments conduction block of local anesthetics[8].

"Dalle et al" explained that clonidine augments the action of hyper polarization by Na^+/K^+pump for the period of repetitive stimulation, increases threshold for initiation of action potential, resulting in slowing or blockade of conduction[24].

VAS score in post-operative period up to 6hrs was comparable in both groups. RC group reached maximum VAS score at 10hrs and R group at 8hrs, showing extended duration of analgesia in RC group. Quazi et al also has similar results[6].

Sedation score was measured as per Ramsay sedation scale[21]. Maximum sedation level in RC group means score were 2.37at 30min as compared with 1.63 at 45min in R group. Our observation concur with those obtained by Gupta et al .

Hemodynamic parameters such as Pulse rate, SBP, DBP, and Spo2 were comparable in both groups; the mean pulse rate in RC group was significantly lower than in R group at regular intervals. None of the patients had significant bradycardia and hypotension. Our observation concur with those obtained by Sidharth et al [7].

Dry mouth was observed in Clonidine group (16%) whereas it was nil in Ropivacaine group. Nausea, Vomiting, Headache was present only in R group. Similar results were obtained by other investigators[6]. No other complications were present in both the groups.

Limitations of our study were small sample size and Drugs (Clonidine and Ropivacaine) were not calculated as per body weight. All the patients irrespective of body weight received the same dose of Ropivacaine and Clonidine. However body weight was comparable in both two groups.

CONCLUSION

CONCLUSION

The addition of clonidine to 0.5% Ropivacaine in supraclavicular brachial plexus block for patients undergoing upper limb surgeries provided rapid onset of sensory and motor blockade and also extends the duration of sensory and motor blockade. In addition it extends the duration of analgesia with good hemodynamic stability with optimum sedation.

SUMMARY

SUMMARY

This prospective Randomized double blind placebo controlled study was done in Mahatma Gandhi Memorial Government Hospital, Trichy from the period of 2014 to 2015.

A total of 60 patients belonging to ASA I& II, aged between 18 to 60 years were scheduled for upper limb surgeries were included in the study.

Patients receiving anticoagulants, H/O coagulopathy and peripheral neuropathy, and age < 18 years, > 60 years, H/O uncontrolled hypertension, refusal of patient's participation were excluded from this study.

Patients were divided into two groups, each group consisting of 30 patients (n=30).

1. RC Group: Patient receiving 1 ml of Clonidine (150 µgm) +35 ml of 0.5% Ropivacaine (175 mg).
2. R Group: Patient receiving 1 ml of Normal saline +35 ml of 0.5% Ropivacaine (175 mg). The parameters observed were

- Time of onset of sensory and motor block,
- Duration of sensory and motor block
- Duration of postoperative analgesia
- Sedation status and hemodynamic variables

In this study following results were obtained

- Rapid onset of sensory and motor block
- Extended duration of sensory and motor block
- Extended duration of postoperative analgesia
- Better operating conditions without major hemodynamic alterations and side effects in RC Group when compared with R Group.

The addition of 150 mcg of clonidine to 35 ml of 0.5% Ropivacaine in supraclavicular brachial plexus block under ultrasound guidance for patients undergoing upper limb surgeries provided rapid onset of sensory and motor blockade. It also extends the duration of sensory and motor blockade. In addition it extends the duration of postoperative analgesia with good hemodynamic stability and optimal sedation.

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BIBLIOGRAPHY

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ANNEXURES

PROFORMA

EVALUATION OF THE EFFECT OF ADDITION OF CLONIDINE TO 0.5% ROPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

NAME : CASE NO: DATE OF SURGERY :

AGE : SEX : WT: HT: IPNO:

ADDRESS :

ASA STATUS: DIAGNOSIS :

SURGERY :

GROUPS :

Control(R) : 35ml of 0.5% ROPIVACINE + 1 ml of saline.

Clonidine(RC): 35ml of 0.5% ROPIVACINE + 150 µg of CLONIDINE.

Patient position :

Duration of surgery :

TIME	**PULSE**	**B.P**	**SPO2**	**SEDATION SCORE**	**ONSET OF SENSORY BLOCK AT C6/T1**	**WRIST FLEXION +/-**	**PAIN SCALE**	**SIDE EFFECTS**
0 min)								
2(min)								
3(min)								
4(min)								
5(min)								
6(min)								
8(min)								
10(min)								
15(min)								
20(min)								
25(min)								
30(min)								
60(min)								
2 (hrs)								
3(hrs)								
4(hrs)								
6(hrs)								
8(hrs)								
10(hrs)								
12(hrs)								
18(hrs)								
20(hrs)								
22(hrs)								
24(hrs)								

SENSORY ONSET TIME:

MOTOR BLOCK ONSET TIME:

DURATION OF POST OPERATIVE ANALGESIA:

PATIENT CONSENT FORM

1) Title of the Study: Effect of addition of Clonidine to 0.5% Ropivacaine in Supraclavicular Brachial plexus block.

Study Centre: Mahathma Gandhi Memorial Government Hospital, Trichy

Patient's name: **Age/Sex:**

Parent/Guardian's Name:

Address:

- The details of the study have been provided to me in writing and explained to me in my own language. I confirm that I have understood the above study and had the opportunity to ask questions about the anaesthetic techniques to be administered to me for surgery and postoperative pain relief.
- I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without affecting the medical care that will normally be provided by the hospital.
- I understand that the doctor involved in the study does not require my permission, to monitor and assess me for various medical parameters
- I agree not to restrict the use of any data or results that arise from this study, provided such a use is only for scientific purpose(s).
- I fully give consent to take part in the study and I have also been explained about the complications that may arise due to the anaesthesia techniques
- I give my consent to undergo the anaesthesiaprocedure , involving brachial plexus block followed by injecting of anaesthetic drug, Ropivacainein supraclavicular region for the study as mentioned in the patient information sheet.
- I consent wholeheartedly after understanding that the study is taken up for the benefit for me

Signature/Thumb impression of the patient:

Date: Place:

Signature of the investigator:

ஒப்புதல் படிவம்

தலைப்பு: மேல்கை, கை, முழங்கை, முன்னங்கை, கை அறுவை சிகிச்சைக்கு ரோப்பிவேகைன் மற்றும் குளோநீடின் மருந்துகளை கொண்டு மேல்கைபுய நரம்பு பின்னல் ப்ளாக் செய்தல் மற்றும் மயக்கமருந்துகளின் விளைவுகளை அறிதல்.

பங்குபெறுபவர் பெயர் :

பரிசோதனை செய்யும் இடம்:

பரிசோதனை எண்:

நோயாளி எண்:

1. நான் இப்பரிசோதனையின் தகவல் படிவம் ..... தேதியிட்ட படிவதை படித்து புரிந்துக் கொண்டேன் என உறுதியளிகேக்கிறேன். அதில் உள்ள சந்தேகங்களை நிவர்த்தி செய்யவும் வாய்ப்பு அளிக்கப்பட்டேன்.

2) என்னுடைய பங்களிப்பு சுய விருப்பத்தின் பேரில் தான் என்பதையும், இதில் இருந்து எந்தநிலையிலும் காரணம் தெரிவிக்காமல் விலகிக்கொள்ளவும் எனக்கு உரிமையுள்ளதையும் அறிந்துக்கொண்டேன் இது என்னுடய மருத்துவ சிகிச்சையை எந்த விதத்திலும் பாதிப்பு அற்படுதது என உணர்துகொண்டேன்.

3). என்னுடைய பரிசோதனை முடிவுகளை எப்பொழுது வேண்டுமானாலும் பயன்படுதிகொள்ள இச்சோதனை அதிகாரிகளுக்கு முழு உரிமை அளிக்கிறேன்.

4). இதன் மூலம் நான் இச்சோதனையில் பங்குபெற முழு சம்மதம் அளிக்கிறேன்.

1). நோயாளின் கையொப்பம்:

2). பரிசோதகரின் கையொப்பம் :

3).உறவினர் கையொப்பம் :

மேல்கை, கை, முழங்கை, முன்னங்கை, கை அறுவை சிகிச்சைக்கு ரோப்பிவேகைன் மற்றும் குளோநீடின் மருந்துகளை கொண்டு மேல்கைபுய நரம்பு பின்னல் ப்ளாக் செய்தல் மற்றும் மயக்கமருந்துகளின் விளைவுகளை அறிதல்

திருச்சி கி.ஆ. பெ. விஸ்வநாதம் மருத்துவக் கல்லூரி மற்றும் மகாத்மா காந்தி நினைவு மருத்துவ மனையில் அறுவை சிகிச்சைக்காக அனுமதிக்கபட்டுள்ளேன். மயக்க மருந்து உயர்நிலை பயிற்சி படிப்பில் முன்றாம் ஆண்டில் இருக்கும் மருத்துவர் அவர்கள் மயக்க மருந்திற்கு உடலின் மாற்றங்கள் குறித்து ஓர் ஆய்வு மேற்கொள்கிறார் என்பதை எனக்கு எடுத்து கூறினர். அந்த அங்கீகாரம் பெற்ற மருந்தை எடுத்து கொள்ள நான் சம்மதிக்கிறேன். மேலும் அந்த மருந்தினால் உடலிற்கு ஏற்படும் மாற்றங்களை ஆய்வு செய்து பதிவு செய்துகொள்ள என் சுயநினைவோடு முழு சம்மதம் அளிக்கிறேன்

இப்படிக்கு

S.No.	Name	Group	Age	Sex	Weight	IP No.	ASA Status	Sensory onset	Motor one set	on of sensory	ion of motor	Intraop_se	Post_OP_	Systolic_E	Diastolic_	Systolic_E	Diastolic_	Systolic_E	Diastolic_	Systolic_E	Diastolic_	Systolic_E	Diastolic_
1	Thandayu	2	52	1	65	45856	I	15	18	480	450	3	1	110	70	110	60	100	60	110	70	120	70
2	Ramesh	2	40	1	56	44672	I	12	16	420	390	2	1	120	80	110	60	110	60	100	60	120	80
3	Muthu	2	40	1	70	45565	I	10	13	390	360	2	1	100	60	110	80	120	80	120	80	110	60
4	Subraman	2	46	1	60	49544	I	5	10	400	370	2	1	130	80	110	60	112	80	114	75	110	70
5	Palaniamn	2	37	2	50	2818	I	8	11	400	360	3	1	110	70	120	80	110	60	110	60	110	60
6	Raja	2	20	1	60	2819	I	10	12	470	425	3	1	100	60	110	80	120	80	120	80	110	60
7	Karuppay	2	55	2	50	7320	I	10	13	470	430	3	1	120	80	110	60	110	70	110	70	110	60
8	Mani	2	58	1	60	11766	I	5	7	370	340	3	1	110	70	100	60	110	70	120	80	110	70
9	Mottaiyan	2	57	1	52	14767	II	10	12	380	360	2	1	140	901	120	70	130	70	110	60	110	60
10	Chandrase	2	24	1	52	15675	I	5	7	390	370	2	1	120	80	120	80	120	70	110	60	120	80
11	Rajeswari	2	40	2	60	16526	I	3	5	545	510	2	1	120	80	110	60	120	80	120	80	120	80
12	Arun	2	22	1	60	17017	I	6	8	535	480	3	1	120	80	120	80	120	70	110	60	110	60
13	Chinnamn	2	56	2	45	17892	I	10	14	470	450	2	1	160	100	130	80	140	90	140	90	130	90
14	Mahesh	2	25	1	56	18133	I	7	10	450	420	2	1	120	80	120	80	110	70	110	70	110	70
15	Rajendran	2	42	1	60	18153	I	8	11	445	410	3	1	140	90	130	90	120	60	110	60	110	60
16	Vedha sha	2	20	2	40	19713	I	6	8	440	390	3	1	130	90	120	80	110	60	110	60	100	60
17	Shappan S	2	25	1	60	18173	I	10	13	420	370	2	1	130	70	130	80	120	70	110	60	110	60
18	Sundaraja	2	30	1	50	24242	I	5	7	435	390	2	1	120	80	110	60	120	70	110	70	110	70
19	Kathayee	2	50	2	50	3829	I	5	8	430	365	2	1	130	80	120	80	120	70	110	70	110	70
20	Jesintha M	2	30	2	50	2817	I	8	12	460	410	2	1	120	80	120	80	120	80	110	70	110	70
21	Prashanth	2	20	1	50	5781	I	7	11	455	400	3	1	130	80	120	80	120	70	120	80	120	80
22	Thiyagara	2	40	1	60	4733	I	6	10	460	390	2	1	130	80	120	80	110	70	110	70	110	70
23	Gnanthan	2	32	2	52	7367	I	10	12	425	390	3	1	130	801	120	80	120	80	110	70	110	70
24	Ramesh	2	35	1	60	5979	I	7	10	390	365	3	1	120	80	110	60	120	80	120	80	120	80
25	Sundaram	2	40	1	62	4689	I	6	9	425	380	2	1	120	80	120	80	110	70	110	70	110	70
26	Thirupathy	2	40	1	60	25514	I	9	12	460	410	3	1	130	80	130	80	120	80	120	80	120	80
27	Anthonian	2	52	2	45	2054	I	7	10	485	430	2	1	130	70	120	70	110	70	120	80	120	80
28	Sanmugan	2	80	2	50	9567	I	7	9	440	375	2	1	110	70	110	70	120	80	110	70	110	70
29	Nagaraj	2	50	1	60	12218	I	8	12	450	405	2	1	120	80	110	60	120	80	110	80	120	80
30	malaiyali	2	48		59	2052	I	6	9	455	425	2	1	120	80	110	70	120	70	110	70	110	70

Systolic_BF	Diastolic_	Systolic_BF	Diastolic_	Systolic_E	Diastolic_	Systolic_BF	Diastolic_B	Systolic_BF	Diastolic_B	SPO2_0m	SPO2_5m	SPO2_15r	SPO2_30r	SPO2_45r	SPO2_60m	SPO2_2hrs	SPO2_6hr	SPO2_12hr	SPO2_24hr	Headache	Nausea	Vomitting
110	60	120	80	120	80	110	70	120	80	100	100	100	100	100	100	100	100	100	100			
120	80	110	60	120	80	120	80	120	80	100	100	100	100	100	100	100	100	100	100			
110	60	130	80	130	80	130	80	120	80	100	100	100	100	100	100	100	100	100	100			
120	80	120	80	110	80	120	70	120	80	100	100	100	100	100	100	100	100	100	100			
120	80	120	70	110	60	120	80	120	80	100	100	100	100	100	100	100	100	100	100			
110	60	130	80	130	80	130	80	120	80	100	100	100	100	100	100	100	100	100	100			
110	60	120	60	120	80	120	80	110	60	99	99	99	99	99	99	99	99	99	99			
120	80	110	60	110	60	110	60	120	80	100	100	100	100	100	100	100	100	100	100			
120	80	110	60	130	80	120	80	120	80	100	100	100	100	100	100	100	100	100	100			
110	70	120	60	110	70	120	80	120	80	100	100	100	100	100	100	100	100	100	100			
120	70	110	70	110	70	120	80	120	80	100	100	100	99	98	99	99	99	99	99			
120	80	110	60	120	80	120	80	120	80	100	100	100	99	98	99	99	99	99	99			
130	80	120	80	120	80	110	70	110	70	100	100	100	100	100	100	100	100	100	100			
110	70	110	70	110	60	120	80	120	80	99	99	99	99	99	99	99	99	99	99			
120	80	110	60	110	60	110	60	110	60	100	100	100	100	100	100	100	100	100	100			
110	70	120	70	120	70	130	60	120	80	99	99	99	99	99	99	99	99	99	99			
110	70	110	80	110	70	120	30	120	80	100	100	100	100	100	100	100	100	100	100			
110	70	110	60	120	80	110	70	110	70	99	99	99	99	99	99	99	99	99	99			
110	70	110	70	110	70	120	80	110	70	99	99	99	99	99	99	99	99	99	99			
110	70	110	60	110	70	110	70	120	80	99	99	99	99	99	99	99	99	99	99			
120	80	120	80	120	80	120	80	110	70	99	99	99	99	99	99	99	99	99	99		N	
120	80	120	80	120	80	110	70	110	70	99	99	99	99	99	99	99	99	99	99			
110	70	110	70	120	80	110	70	120	80	99	99	99	99	99	99	99	99	99	99			N
110	70	110	70	120	80	120	80	120	70	99	99	99	99	99	99	99	99	99	99	H		
110	70	110	70	110	60	120	80	120	80	99	99	99	99	99	99	99	99	99	99	H		
110	70	110	60	110	70	120	80	130	80	99	99	99	99	99	99	99	99	99	99	H		
120	80	110	70	120	70	120	80	120	80	99	99	99	99	99	99	99	99	99	99			
120	80	120	80	110	60	110	70	120	70	99	99	99	99	99	99	99	99	99	99			
110	60	120	80	110	60	110	60	110	60	99	99	99	99	99	99	99	99	99	99			
110	60	120	80	120	80	110	60	110	70	99	99	99	99	99	99	99	99	99	99			

S.No.	Name	Group	Age	Sex	Weight	IP No.	ASA Status	Sensory onset	Motor one set	on of sensorjon of motor	Intraop_se	Post_OP_	Systolic_E	Diastolic_	Systolic_E	Diastolic_	Systolic_E	Diastolic_	Systolic_E	Diastolic_
1	MGR	RC	32	M	60	51625	I	10	15	510	485	3	1	140	70	140	60	130	70	120	80
2	Marudhamuthu	RC	37	M	65	3123	I	8	12	515	490	2	1	110	70	110	70	110	70	110	70
3	Nagaraj	RC	45	M	70	5641	I	9	14	500	470	2	1	120	80	110	60	120	80	110	60
4	Ragavendra	RC	19	M	60	60649	I	4	7	520	490	2	1	110	70	110	60	120	80	110	60
5	Chinnadurai	RC	35	M	65	7621	I	7	9	640	595	3	1	140	90	110	60	120	80	110	60
6	Nandhakumar	RC	38	M	60	60604	I	7	10	620	570	3	1	130	90	120	70	110	60	120	80
7	Shanmughavalli	RC	37	F	60	60605	I	7	10	485	460	3	1	130	90	120	70	110	60	110	60
8	Nagalakhsmi	RC	44	F	80	12003	I	4	9	510	440	3	1	140	90	130	80	120	80	100	70
9	Akila	RC	34	F	80	8709	I	6	9	520	485	2	1	110	70	110	60	108	60	110	70
10	Venkatachalam	RC	29	M	60	10548	II	10	14	550	500	2	1	110	70	110	70	110	68	110	70
11	Marudhamuthu	RC	37	M	68	12828	I	5	8	515	490	2	1	110	70	110	60	100	60	110	70
12	Arumugam	RC	57	M	54	13525	II	2	6	545	505	3	1	140	82	129	81	122	79	105	68
13	Veeramalai	RC	55	M	55	13366	I	4	6	600	570	2	1	120	80	120	80	110	60	110	70
14	Perumal	RC	53	M	60	14991	I	10	13	500	470	2	1	140	80	140	90	130	70	110	60
15	Rajendiran	RC	47	M	64	14794	II	4	6	630	560	3	1	120	80	120	80	110	60	120	80
16	Jancy	RC	36	F	55	14959	I	4	11	430	390	3	1	130	82	117	77	111	72	103	67
17	Paramasivam	RC	52	M	50	15311	I	4	5	395	365	2	1	130	80	130	80	110	70	110	70
18	Pattu roaj	RC	26	F	50	16350	I	2	5	550	520	2	1	118	76	118	70	111	69	116	70
19	Selvam	RC	31	M	60	15804	I	5	7	520	490	2	1	120	80	110	60	110	70	120	80
20	Priya	RC	26	F	45	17187	I	5	8	450	420	2	1	120	80	120	80	120	80	120	70
21	Kumara vadivel	RC	39	M	65	16951	I	7	10	620	570	3	1	120	80	120	80	120	80	120	60
22	Meena	RC	20	F	45	17380	I	10	13	555	545	2	1	130	90	120	80	110	70	120	80
23	Catherine	RC	20	F	45	17188	I	3	5	490	460	3	1	160	100	130	80	140	96	140	90
24	Karumpayee	RC	18	F	45	13625	I	12	15	560	525	3	1	120	80	120	80	120	80	120	70
25	Nagalakhsmi	RC	27	F	55	14979	I	5	7	540	500	2	1	120	70	110	60	120	80	100	60
26	Kaliya sundaram	RC	55	M	65	17189	I	2	5	605	570	3	1	110	73	103	66	103	68	108	66
27	Raj kumar	RC	20	M	50	19671	I	6	10	575	490	2	1	120	80	110	60	120	80	120	60
28	Latha	RC	40	F	70	17381	I	3	6	615	510	2	1	140	90	140	80	140	90	140	80
29	GOVINDHARAJ	RC	39	M	60	16536	I	5	8	425	520	2	1	120	80	110	70	100	60	110	60
30	J bhaula	RC	55	F	59	14768	I	4	8	550	485	2	1	120	80	110	60	110	60	110	70

Systolic_E	Diastolic_	Systolic_BF	Diastolic_	Systolic_BF	Diastolic_	Systolic_E	Diastolic_	Systolic_BF	Diastolic_B	Systolic_BF	Diastolic_B	SPO2_0m	SPO2_5m	SPO2_15r	SPO2_30r	SPO2_45r	SPO2_60m	SPO2_2hrs	SPO2_6hr	SPO2_12hr	SPO2_24hr	Side effect
120	80	110	80	110	80	110	80	110	80	120	80	100	100	100	100	100	100	100	100	100	100	DM
110	70	120	80	120	70	110	70	110	60	120	80	100	100	100	100	100	100	100	100	100	100	DM
120	80	120	80	110	60	120	80	120	80	120	80	100	100	100	100	100	100	100	100	100	100	
120	80	120	80	110	60	120	80	120	80	120	80	100	100	100	100	100	100	100	100	100	100	DM
110	60	120	80	120	80	110	60	110	60	120	70	100	100	100	100	100	100	100	100	100	100	
120	80	110	60	120	80	120	70	120	80	120	80	100	100	100	100	100	100	100	100	100	100	DM
110	60	110	70	110	60	120	80	110	60	120	80	100	100	100	100	100	100	100	100	100	100	DM
110	70	120	80	118	80	120	80	120	80	120	80	99	99	99	99	99	99	99	99	99	99	
110	70	120	80	120	80	120	80	110	70	110	70	100	100	100	100	100	100	100	100	100	100	
110	70	110	60	120	80	120	80	110	60	110	60	100	100	100	100	100	100	100	100	100	100	
120	80	120	70	120	80	110	60	110	70	120	80	100	100	100	100	100	100	100	100	100	100	DM
117	69	124	74	120	80	120	20	120	80	120	70	100	100	100	100	100	100	100	100	100	100	
110	60	110	60	110	60	110	60	120	70	110	60	99	99	99	99	99	99	99	99	99	99	
110	60	120	80	110	60	130	80	120	80	120	80	100	100	100	100	100	100	100	100	100	100	DM
120	80	110	70	120	80	120	80	120	80	110	60	100	100	100	100	100	100	100	100	100	100	
108	70	97	65	100	60	110	70	110	70	120	80	100	100	100	99	98	99	99	99	99	99	
120	80	110	60	110	60	110	60	110	60	110	60	99	99	99	99	99	99	99	99	99	99	DM
116	70	110	60	110	70	120	80	120	80	120	80	100	100	100	99	98	99	99	99	99	99	
120	80	110	60	120	80	110	60	110	70	120	80	100	100	100	100	100	100	100	100	100	100	
120	70	120	80	110	70	120	80	110	70	120	80	100	100	100	100	100	100	100	100	100	100	DM
120	60	120	80	120	80	110	70	120	80	120	80	100	100	100	100	100	100	100	100	100	100	
120	80	120	80	120	70	120	80	110	60	120	60	100	100	100	100	100	100	100	100	100	100	
140	90	130	80	120	80	120	80	120	70	110	70	99	99	99	99	99	99	99	99	99	99	DM
120	70	120	80	110	70	120	80	110	70	120	80	100	100	100	100	100	100	100	100	100	100	
110	70	110	60	110	70	110	70	120	80	120	80	100	100	100	100	100	100	100	100	100	100	
110	70	110	70	110	60	120	80	110	60	110	70	100	100	100	100	100	100	100	100	100	100	
120	60	110	70	120	80	110	60	110	60	110	60	100	100	100	100	100	100	100	100	100	100	
140	80	130	80	130	80	130	80	120	80	120	80	100	100	98	98	98	98	99	99	99	99	
110	60	110	60	120	80	130	70	110	60	120	70	99	99	99	99	99	99	99	99	99	99	
110	70	110	70	110	60	110	70	120	80	120	80	99	99	99	99	99	99	99	99	99	99	